But Does it Transfer: Knowledge Revision in the Context of Refutation Texts

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Misconceptions

Misconceptions are prevalent and can interfere with learning (Bensley & Lilienfeld, 2017; Vosniadou, 1992).

Misconceptions continue to persist even when people are aware of the correct, scientific information (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012; Rapp, Hinze, Kohlhepp, & Ryskin, 2013)
People have strong, personal convictions about their beliefs and believe themselves to be the best source of correct information (Cook, Ecker, & Lewandowsky, 2015)
Knowledge Revision

Researchers have identified **refutation texts** as a powerful tool to help readers revise misconceptions (Tippett, 2010; Sinatra & Broughton, 2011)

- State
- Refute
- Explain

**Knowledge revision** involves acquisition of correct knowledge which produces a gradual reduction in the activation of related incorrect knowledge or misconceptions.

Refutation texts facilitate knowledge revision through a **competing activation mechanism** (KReC; Kendeou & O’Brien, 2014).
But Does it Transfer?

- Refutation texts may facilitate spontaneous, near transfer of knowledge (Beker, Kim, Van Boekel, van den Broek, Kendeou, 2019)

- Individuals will likely re-encounter information that conflicts with their revised knowledge.

- Refutation texts may facilitate near transfer of revised knowledge even when misconception is reactivated (Kim & Kendeou, 2019)
1. Does revised knowledge from a refutation text transfer to a subsequent transfer text that *re-activates the same misconception*?

2. Does the misconception need to be resolved in new contexts for transfer to occur?
Refutation Text

**Introduction**
Nick and Sarah both recently had signed up to volunteer at the university’s daycare [...] 

**Refutation**
Sarah told Nick that she thought these children were getting too many vaccines too soon. She thought many vaccines would compromise their immune system and make them very sick. Nick explained this was not true.

**Explanation**
Nick continued to say that research has shown that healthy children’s immune systems are strong from a young age because human bodies constantly have to deal with a whole host of pathogens in the world [...] 

**Filler**
Sarah went about preparing healthy snacks for the children that were there that day [...] 

**Target**
multiple vaccines won’t overwhelm the body.

**Conclusion**
Nick helped Sarah finish preparing the rest of the food [...]
Transfer Text

**Introduction**
John and Caroline took Melanie, their two-month-old, to the pediatrician’s office [...] 

**Event**
[...] Melanie started crying hysterically. Caroline was usually able to calm Melanie down, but Melanie was inconsolable.

**Activation**
Caroline needed to feed Melanie, so she searched for the bottle. Then, she remembered that Melanie had gotten four vaccines this time, instead of just one.

**Resolution**
[...] She fed Melanie and over Melanie, Caroline

**No Resolution (Filler)**
Caroline couldn't find the... and Caroline remembered

**Target**
multiple vaccines won’t overwhelm the body.

**Conclusion**
Caroline and John started to head back home[...]
If the resolution is necessary, we should see faster reading times of the target sentence when the transfer text includes a resolution section compared to when it does not include a resolution.
Method & Procedure

Participants: 40 undergraduates (11 male)

Pretest: 8 T/F questions w/ confidence ratings (62%)

Texts: 8 refutation and 8 transfer texts
  – Refutation texts addressed socio-scientific and psychological misconceptions

Posttest: 8 questions
  – T/F (-1 or 1 point) + Explanation (2 or 0 points) + Confidence Rating (1 – not at all confident, 5 = completely confident)
Results

- DV: Difference in reading times of target sentence across positions (before – after) for
  - (a) refutation texts
  - (b) transfer texts with resolution
  - (c) transfer texts without resolution
**Hypotheses**

RQ1: Does transfer occur?

RQ2: Does resolution play a role in transfer?
• Difference scores for transfer texts were significantly larger than difference scores for refutation texts, $F(3, 35) = 8.953, p = .001, \eta_p^2 = .34$.

• Resolution did not play a role in transfer ($t = .38, p > .05$).
Experiment 2

Does transfer still occur when you increase the temporal distance between refutation and transfer texts?
Method & Procedure

Participants: 42 undergraduates (16 male)

Pretest: 8 T/F questions w/ confidence ratings (65%)

Texts: 8 refutation and 8 transfer texts

Posttest: 8 questions
  – T/F (-1 or 1 points) + Explanation (2 or 0 points) + Confidence Rating (1 – not at all confident, 5 = completely confident)
• Difference scores were not significantly different across all text types, $F(3, 37) = 2.64, p > .05, \eta_p^2 = .09$. 
Knowledge Revision Outcomes

Experiment 1

Experiment 2

Scores (TF * Confidence)

-2 -1 0 1 2 3 4 5

Pretest  Posttest

$F(1, 39) = 223.27, p < .001, \eta_p^2 = .85$

$F(1, 41) = 217.91, p < .001, \eta_p^2 = .84$
Discussion & Future Directions

• Transfer of revised knowledge to new contexts can occur regardless of whether the misconception is resolved or not (Experiment 1), but it is limited to near temporal contexts (Experiment 2).

• Accuracy on T/F questions increased from pretest to posttest.

• Misconception prevalence varied across participants (38% - 100%)
  – Evaluate individual differences in prior knowledge
Take-Home Message

• By reducing interference from misconceptions, refutation texts may be the most effective at promoting learning when they are used immediately before disseminating new, relevant material.
Thank you!

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