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RESEARCH ARTICLE

DIFFERENCES IN ADULT AND CHILD FALSE MEMORIES BASED ON DIFFERENT TYPES OF ASSOCIATED WORDS

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Abstract

Introduction:-

Many studies have examined the differences in DRM tasks that use semantically, phonologically, and orthographically associated lists with a false target. Similar studies comparing children to adults have not came to a consensus about whether significant differences exist based on age. The present study examines both children and adults and uses three DRM tasks. The first list contains a semantically associated false target that is not orthographically or phonologically associated with any other words on the list. The next list uses a phonologically associated false target that is not semantically or orthographically associated to the words on the list. Lastly, the final list uses an orthographically associated false target that is not semantically or phonologically associated to the words on the list. This study directly examines isolated versions of these three types of associates finding significant differences between all three and suggests how this may impact results of similar previous studies and what this means in terms of the fuzzy-trace theory.

Background:

False memories are a topic in psychology with relatively newground-breaking studies published in the 1990's(Reyna & Farrell, 1997; Roediger&Mcdermott, 1995). Most of these studies have commonalities that have been developed throughout the past few years. The DRM (Deese–Roediger–McDermott) paradigm is a common paradigm developed in 1959 that is now used to study false memories (Roediger&Mcdermott, 1995). The basic idea of the DRM paradigm is to present the participant with a list to try to remember that is filled with words associated to some target without the identified target on the list (Pardilla-Delgado& Payne, 2017). How the words are associated is often manipulated; the three most common associates that produce false memories are semantic, phonological, and orthographical (Lambert 2001; Watson, Balota, &Roediger, 2003).

Semantic associates are words that are associated with one another because of a similar meaning (Ex. tree, leaf, and forest). Phonological associates are words that are associated with one another because of a similar sound (Ex. glad, had, and pad). Orthographical associates are words that are associated with one another because of a similar spelling (Ex. why, wry, and way). Often times when individuals take a DRM paradigm, the individuals falsely recall a target word that is associated with other words in the list even though the target was not present in the list (Howe et al., 2013).

Another commonality in articles on false memories is fuzzy-trace memory. This is one of the leading theories used to explain how false memories are developed. A contrasting idea is prospect theory, but fuzzy-trace theory often produces more consistent results (Kühberger& Tanner, 2009). This theory also attempts to explain the differences

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seen in semantic and phonological memories. Fuzzy-trace theory proposes that there are two main different types of memory processes: verbatim and gist memory.Verbatim memory is closely linked to visuospatial memory where gist memory is more closely related to ideas and episodic memory. Previous research suggests that verbatim memory is more susceptible to making an error in phonologically and orthographically associated lists while gist memory is more susceptible to making an error in semantically associated lists (Obidziński&Nieznański 2017).

False memory studies that directly compared children to adults often times found significant differences. One study looked at why children and adults were susceptible to semantic and phonological false memories and found that phoneme awareness negatively predicted children's false recall of phonological lures (Mcgeown et al., 2014). This is surprising when considering the findings from another study demonstrated that as age increased, so did recall of the critical lure. Also, as age increased, other erroneous recalls decreased (Mcguire, London, & Wright, 2015). This was also confirmed by another study in which both younger and older children had higher numbers of spontaneous false memories than the adults, but they had lower accuracy than the adults. The DRM paradigm showed the standard results that older children and adults were more likely to produce false memories than the younger children (Otgaar et al., 2013).

Although most studies examine phonologically similar and semantically similar words, one study in particular that looked at orthographically similar words and how the creation of false memories in those words relate to dyslexia in childrenprovided evidence that impairments of memory processes were not shown for both verbatim and gist memory. It also demonstrated that orthographically similar words were affected by dyslexia(Obidziński&Nieznański, 2017).

Previous research demonstrated that lists with all phonological associates or all semantic associates have the lowest proportion of false recall while lists with half semantic and half phonological associates have the highest proportion of false recall, and interestingly, the largest increase in false recall is from just adding a single word of the other type of associate (Ex. A list of words semantically associated to chair, such as desk and sit, improved dramatically when just one phonological associate (hair or cheer) was added (Finley et al., 2017).Although previous studies have examined semantic, phonological, and orthographical associates in some combination, there has not been a study that demonstrates the differences in these three associates in the same study. The present study is developed to test the relationship of phonologically, orthographically, and semantically associated words and false memories at two different stages of life (childhood and early adulthood).

Method:-

Participants:

This study receivedIRB approval prior to collecting any data.The participants were 35young adults (18-25 years old) recruited from Marshall University and 65 underage participants(9-11 years old) recruited from local elementary schools. Participants under the age of 18 had a consent waiver signed by a parent or legal guardian and gave verbal and signed assent the day of the experiment. Participants over the age of 18 gave verbal consent the day of the experiment.Due to inconsistencies with answering (ex. answered yes to recognized the word, but marked a 1 indicating the word was not on the previous list), scores of seven of the underage participants were removed. Participants from the two local elementary schools had a mean age of 9.52 with a standard deviation of 0.599. Participants from Marshall University had a mean age of 18.89 with a standard deviation of 1.278.

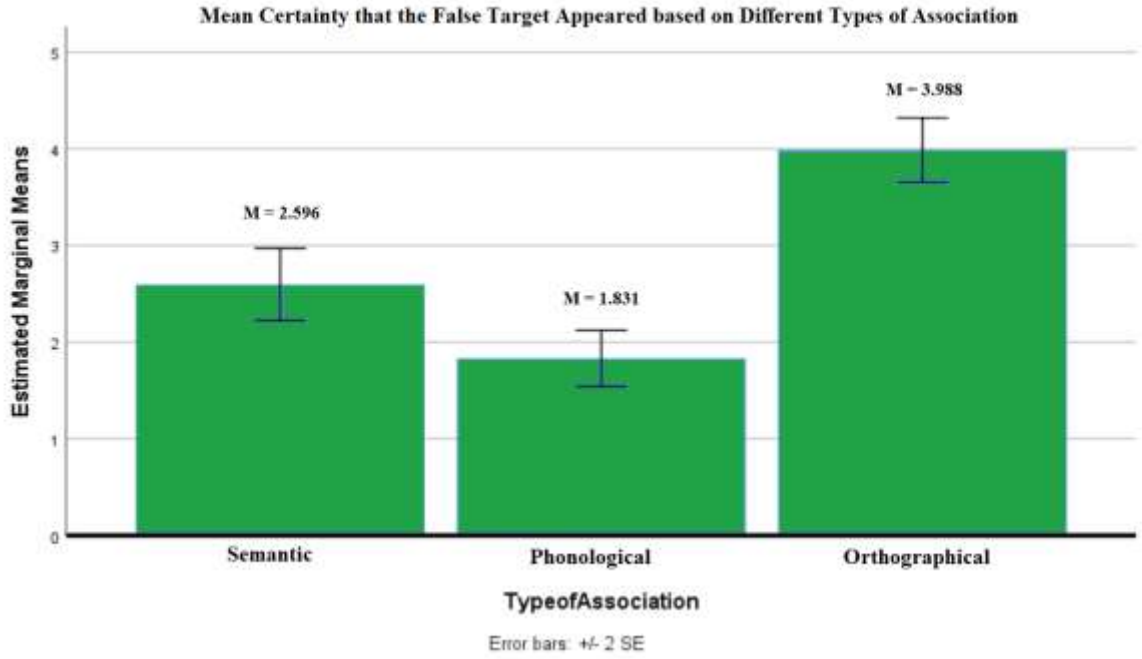
Procedure:

For the all participants, DRM tasks were given (Pardilla-Delgado& Payne, 2017). The participants were presented with a list and were told this is a study list and they needed to try to remember as many words as possible from the list. Thefirst study list presented was a semantically associated DRM task with 14 words and participants were given 1 minute to study. The participants were then asked to recognize the words from a recognition list and list their certainty (1 = certain not on the list to 5 = certain it was on the list). The list contained the 14 words from before, a false recognition target, and 3 unrelated controls. The participants then repeated this DRM task for a phonologically (defined as rhyming or homophone for this study) associated list, and an orthographically associated list (defined as differing by only one letter for this study). The false targets for the three DRM tasks based on semantically, phonologically, and orthographically similar words were tree, knead, and bet. Full lists can be found in the appendix. An important part of this study is that the orthographically associated false target was not phonologically associated or semantically associated with any words on the study list, the phonologically associated false target was

not orthographically or semantically associated with any words on the study list, and the semantically associated false target was not phonologically or orthographically associated with any words on the list.

Results:-

A 2x2x3 repeated measures ANOVA was conducted to compare the effects of gender and age (adult or child) on when the false target was semantically, phonologically, and orthographically associated.Levene's test was violated so a significance level of .01 was used instead of .05. There was a significant difference in type of associate, $F(2, 172) = 43.831$, $p < .001$, partial $\eta 2 = .338$. There were no significant interactions or other significant main effects. Post-hoc tests revealed the rating of certainty that thesemantically associated false target appeared, rating of certainty that the phonologically associated false target appeared, and rating of certainty that the orthographically associated false target appeared significantly differed from one another.



Implications:

There is a significant difference in the type of associate that was falsely remembered as expected from previous studies. The average level of certainty of orthographically related target was about "pretty certain this was on the list" while the average level of certainty of phonologically related target was near "pretty certain this was not on the list" and the average level of certainty of the semantically related target was between "pretty certain this was not on the list" and "not certain either way". This provides evidence that there should be more investigation into the differences in effects of orthographical false targets and phonological false targets and they should not be treated as the same thing. The difference between the phonologically related target and semantically related target may be statistically significant, but it is not practically significant because both are fairly close to "pretty certain this was not on the list" on average. If a recognition list were given, this could suggest that orthographically similar words may have some impact in past studies when they published the interaction as a phonologically associated word.

Another interesting result is that since fuzzy-trace theory suggests that verbatim memory is more susceptible to making an error in phonologically and orthographically associated lists while gist memory is more susceptible to making an error in semantically associated lists (Obidziński&Nieznański 2017), we may expect that the certainty of the orthographically associated and phonologically associated false targets would be similar. However, that is not the case. The phonologically associated false target had a low certainty level of less than 2, suggesting that most individuals indicated they were pretty sure this word was not on the list while the orthographically had a high certainty level of almost 4, suggesting that most individuals indicated that they were pretty sure the word was on the

list. This suggests that the divide between verbatim and gist memory when doing a DRM task may not be so straightforward and should be investigated further.

The lack of a significant difference in the adult and child group is not very surprising since the children included in this study were ages 9-11. A previous study (Otgaar et al., 2013) broke children into two groups and found developmental differences in younger (6-8 years old) and older children (10-12 years old) but found no difference in older children and adults.

Limitations/Future Studies:
There are a few limitations to this study that should be acknowledged. To obtain words that are phonologically similar, but not orthographically similar and vice-versa, the following definitions were used: phonologically similar words must rhyme or be homonyms (Johnson, n.d.) and orthographically similar words must differ by one letter (Love, 2012). Although these definitions are often different in different studies, this allowed the DRM tasks to test phonologically and orthographically similar words separately which very few studies have done in the past. Further studies could focus only on these differences and develop a slightly modified definition of phonologically and orthographically similar words.

This study looks at children ages 9-11 and young adults ages 18-25, but it does not look at the rest of the lifespan. There is very little research on false memories in middle adulthood (about age 35-60). This study also did not include anyyounger children (ages 6-8) or older adults; however, these populations are studied much more frequently.

Another limitation is, since the sample size was limited, there may be a counterbalancing issue in the order that the different types of associates were presented. With every group, the word lists were presented in order of semantic, phonologic, and then orthographic associated lists.

There should be a comparison done with a researcher reading the study lists aloud and the participants doing a free recall. The fact that participants visually studied the words could be a reason for the orthographically associated target having such a higher mean of certainty that it appeared. By this logic, there could possibly be similar results in favor of the phonologically associated target in such an experiment.

Study List 1:
Forest
Bark
Oak
Leaf
Pine
Maple
Limb
Apple
Log
Wood
Timber
Stump
Cherry
Sapling

Word	Was this word on the list that was presented to you? Write Y for yes or N for no.	How certain are you that the word appeared on the list? (Rated from 1 – 5, 1 being certain it did not appear and 5 being certain it did appear)
Cherry		
Forest		
Bark		
Timber		
Tree		
Salt		

Sapling		
Stump		
Apple		
Limb		
Pine		
Log		
Car		
Oak		
Toy		
Maple		
Wood		
Leaf		

Study List 2:
Plead
Greed
Lead
Seed
Need
Read
Bead
Speed
Weed
Feed
Deed
Breed
Reed
Steed

Word	Was this word on the list that was presented to you? Write Y for yes or N for no.	How certain are you that the word appeared on the list? (Rated from 1 – 5, 1 being certain it did not appear and 5 being certain it did appear)
Need		
Weed		
Speed		
Frog		
Bead		
Steed		
Knead		
Reed		
Breed		
Plead		
Chair		
Greed		
Feed		
Lead		
Deed		
Music		
Seed		
Read		

Study List 3:
Bat
Bit

Best
Belt
But
Beat
Beg
Beta
Bee
Beet
Bed
Ben

Word	Was this word on the list that was presented to you? Write Y for yes or N for no.	How certain are you that the word appeared on the list? (Rated from 1 – 5, 1 being certain it did not appear and 5 being certain it did appear)
Bat		
Belt		
Best		
Air		
Bet		
Bit		
Bel		
Beet		
Beta		
But		
Crate		
Beat		
Bed		
Bot		
Ben		
Book		
Beg		
Bee		

Bot
Bel

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