APA citation of journal article: Kang, O., & Wheatley, T. (2017). Pupil dilation patterns spontaneously synchronize across individuals during shared attention. Journal of Experimental Psychology: General, 146(4), 569–576. https://doi.org/10.1037/xge0000271

The Basics:

1. What was the broad question being asked by this research project? What was the specific question being asked by this research project?
    a. Summarize the background information on the research topic in three sentences.
    b. What is the gap in the literature identified by the researchers? What question(s) are they trying to answer? What is their hypothesis and what should happen if the author's hypothesis is true?
    c. What are alternative hypotheses?

The broad question being asked was if people share spontaneous pupil dilation patterns when speaking with one another as a reflection of shared conscious attention and if the content or type of conversation (emotional, non-engaging, etc.) affected the pupil dilations of the pairs. More specifically, Kang and Wheatly tested whether "pupillary dilations provide a temporally sensitive and honest signal of shared attention." The important background information is as follows: 1) We know that humans are social animals and attending to the same information as others enables us to communicate and form connections, 2) humans unconsciously mirror and imitate other people and our imitation and mirroring of another person is positively correlated with our relationship with them (the stronger the relationship, the more the mirroring), and 3) humans share a greater connection with those who are similar to them in posture, vocal cadence, facial expressions, and eyeblinks. The main gap in literature surrounding this topic is that there simply is not a lot of research or findings on how humans share attention. Moreover, it is difficult to figure out how humans share attention because it is extremely difficult to catch it in the act. Kang and Wheatly hypothesized that people would indeed spontaneously share pupil dilations as a result of sharing a connection and speaking with one another. Their hypothesis was based on previous research that demonstrated that "pupil dilation patterns provide a moment-by-moment attentional trace." If the dilation of pupils does indeed mirror the "ebb and flow of one's attention", two people should share the same pupillary dilations when sharing attention. The null hypothesis would be that pupil dilations are not affected by shared attention and the type of conversation. The alternative hypothesis would be that people do indeed share pupil dilations as a result of attention sharing.

2. What experiments were done to test the hypothesis or investigate the research question?
    a. Explain the task design – what are participants instructed to do and what is being measured? Think about the independent and dependent variables.

The participants were college students from Dartmouth, all over the age of 18 and all with corrected-to-normal vision. There were three groups of students: a smaller listening group with white females who showed high expressivity, a larger group of listeners (previously tested for levels of empathy), and finally a group of raters who were supposed to rate the emotional nature of the conversations. The experiment was conducted as follows. The speakers were recorded telling personal stories, as well as specifically

emotional ones. Their pupil dilations were tracked using an eye-tracker. The listeners then watched these videos of the speakers and their pupil dilations were tracked as well. They then rated the speaker on how "Likeable" or engaging they were. Raters then listened to audio-tracks and made continuous ratings on the nature of engagement, using a 1-9 scale. Kang and Wheatly were measuring the synchrony of pupil dilations between the speaker and the listener and how the synchrony of dilations was correlated to the nature of the conversation. The independent variable was the nature (emotion and engagement) of the story, while the dependent variable was pupil dilation.

3. What evidence supports each of the conclusions?
    a. Before you read the discussion, summarize the main findings and link each one back to the research question(s). How does each result inform the hypothesis?

Through reviewing, comparing, and aligning the videos of listeners and speakers, Kang and Wheatley found a high correlation between speaker expressivity and listener empathy on pupillary synchrony. This means that they found that the pupil dilations of listeners synchronized with the video of the speakers when the speakers were highly expressive, and the listeners were highly empathetic. Yet, they did not share pupil dilations when the speaker had low levels of expressiveness or the listener had lower levels of empathy. These results allowed Kang and Wheatley reject the null hypothesis in favor of the alternative hypothesis that people do indeed share pupil dilations as a result of attention sharing and their pupil dilations are positively correlated with the nature of the conversation.

4. What are the major conclusions?
    a. What do the results add to the field? How do the researchers interpret their findings? Summarize any limitations identified by the researchers.

The results add a very important point of information to the field of human relations and communication, as well as open up many other questions to the field such as what else could be decoded from pupil dilations and more specifically, "is pupillary synchrony between speakers and listeners dependent on a passive listener?" Although no limitations were identified by Kang and Wheatley, I'd say a major limitation is that the prior experiences and views of the listeners was not controlled for. For example, disregarding the level of empathy of each listener, some listeners may simply show higher levels of empathy to male speakers opposed to female ones. Moreover, the study is not generalizable because all of the speakers were white women. Another huge limitation is that Kang and Wheatley heavily focused on the aspect of shared attention, but there is no way to calculate the attention of a pre-recorded video of a person, thus they only measures the attention of the listener.

The Critique:

1. Is the paper well written? How do you know? For week 2 & later, use this space to practice headlines & summaries of the articles via tweets.

I'd say the article is very well written. Although a scientific-article, it is extremely easy for any audience to understand. Kang and Wheatley explain their previous research, their hypothesis, their procedure, results, and implications of the results extremely clearly.

Summary for a lay audience:

Humans are social animals who rely on shared attention to communicate with one another. A study now shows that you may be able to tell whether people are sharing attention by looking at their eyes. An experiment was conducted in which a listener watched a video of another person telling a story. The listener's pupil dilations were then measured and compared to the speaker's pupils to see whether the listener's pupils synchronized with the speaker's. The researchers found that the pupils of the listener did indeed synchronize with the pupil of the speaker if the listener was engaged, interested in the story, and emphatic. Furthermore, the speaker had to be expressive.

Summary for a scientific audience:

Researchers hypothesized that people would spontaneously share pupil dilations as a result of sharing a connection. Furthermore, if the dilation of pupils does indeed mirror the "ebb and flow of one's attention", two people should share the same pupillary dilations when sharing attention. So, an experiment was conducted to test whether pupil dilations really do spontaneously synchronize as a result of a shared connection. The null hypothesis was that pupil dilations are not affected by shared attention and the type of conversation. The alternative hypothesis was that people do indeed share pupil dilations as a result of attention sharing. The researchers rejected the null in favor of the alternative hypothesis when it was found that the pupils of the listener did indeed synchronize with the pupil of the speaker under certain conditions. Specifically, the synchrony of pupil dilations depends upon and is positively correlated with the expressiveness of the speaker, the level of empathy of the listener, and the general nature of the conversation. The more expressive the speaker, the more empathetic the listener, and the more interesting and emotional the conversation, the more likely the listener's pupils are to synchronize with the speaker's pupils.

2. Do the conclusions seem logical given the data processed? Why or why not? Another way of thinking about this: do the results adequately support the conclusions that are drawn? Are there alternative explanations for the findings? What inferences about the hypotheses and questions can be made based on these results?

   Not really. As I stated before, although they did find that the listeners' pupils did synchronize with the speaker when the speaker was highly expressive, and the listener was highly empathetic, Kang and Wheatley originally sought to tie their findings back to shared attention, something that they ultimately did not do.

3. Are the conclusions important? How do you think this relates to everyday behavior?

   Yes, I still believe that the conclusions are important in that it does show that the pupils of a listener synchronize with the pupils of a speaker when the listener is engaged and empathetic. This relates to everyday behavior in that there is now simply a way, although

extremely difficult, to tell when two people are making a connection and when one is paying attention to the other.

4. What were the best aspects of the research presented, and how could the research be improved? Name at least one way to improve the experiment.

   The best aspect of the research presented was how clear and concise it was. Kang and Wheatley beautifully laid out every step of their experiment, so it can be easily replicated However the main problem and area where the research could be improved is simply by recording the eyes of two people having a conversation opposed to someone watching a video of another person speak.

5. How would you follow-up this experiment or study?

   I would follow-up this experiment by conducting another experiment where the synchrony of pupil dilations as a result of shared attention is actually looked for. I would also test people of different sexes and races.

Additional Resources: What are the basic concepts that you need to know to understand the science presented in your paper? What other information or resources would help you better understand the paper? This is helpful to consider for your science communication pieces.

There are really no basic concepts I can think of that one needs to know to understand the science explained in this paper. It is extremely straightforward and comprehensive.

Further Questions:
Write at least five comments or questions about the article to discuss with the class.

1. Why were all the speakers women?
2. Why was race controlled for?
3. Has this been further tested on a neural level?
4. Once again, overall, I though the paper was easy to read and interesting.
5. What are the implications of their findings and can we use this knowledge in everyday life or in a way to improve human interactions?