The Influence of Stereotypes on Knowledge Attribution:

Does an Actor's Group Membership Influence How Knowledgeable They are Seen to be?

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Reasoning about what people know and do not know is very prevalent in our daily lives. Understanding if an individual knows or does not know something affects the way people think and behave towards them (Malle & Nelson, 2003). Furthermore, people are more likely to listen to and follow individuals to whom they attribute knowledge. For example, if a sudden medical emergency occurs, people turn to those who have been trained in handling emergency situations for guidance because they assume such individuals know what to do.

Philosophers have struggled for thousands of years to answer the question, "How do we decide whether an individual truly 'knows' something?" Numerous instances exist in which an individual can appear as knowledgeable, without really having knowledge. This can occur when a person simply "gets lucky" in getting something correct. Consider a case where a person is correct about their belief on a given topic, but the reasons for why they are correct are not the real reasons for why their belief is true. Does this individual truly have knowledge about the subject? Or were they merely lucky in getting it correct?

The theory in philosophy that addresses this issue is known as Justified True Belief Theory. This theory holds that there are three conditions that must be met for a person to possess "true" knowledge: the person must believe something, that thing must actually be true, and the reasons the person has for their belief must be logical (Gettier, 1963). Gettier (1963) observed, however, that there are cases where these conditions are met, but the person may not have "true" knowledge. To illustrate this, consider the "Smith case" from Gettier (1963):

> "Two men, Smith and Jones, have applied to the same job at the same company. Much to Smith's disappointment, the president of the company has told Smith that Jones will ultimately get the job. Smith then notices that Jones has ten coins in his pocket, coins

> which Smith counted himself… Smith then infers that the man who gets the job (who he assumes will be Jones) will have ten coins in his pocket… a belief that is well founded by the evidence and therefore justified. However, quite unexpectedly, Smith ends up getting the job! And, unbeknownst to himself, Smith coincidentally also has ten coins in his pocket…[Smith's] belief that the man who will get the job will have ten coins in his pocket still turned out to be true, just not for the reason he thought (Gettier, 1963)."

Here, although Smith's belief was both true and justified, Gettier argued that people would not judge Smith to have knowledge in this case, as Smith's reasons for holding his belief are not the actual reasons for why the belief is true.

Gettier argued that in cases such as this where a protagonist is right but for the wrong reasons, people will fail to attribute knowledge to the protagonist. Such cases are referred to as Gettier Cases. Despite Gettier's arguments however, a recent study by Turri, Buckwalter, and Blouw (2015) found that when presented with a Gettier Case of a noticeable but failed threat to the truth of a belief (such as in the "Smith case" above), people still attributed knowledge to the protagonist. This result suggests that ordinary people do not reason about knowledge in the way Gettier suggested. Rather, lay people seem to attribute knowledge even when protagonists' beliefs are correct simply because they were lucky.

Although the work of Turri et al. (2015) thus sheds some light on how lay people actually reason about knowledge and luck, research regarding this topic is inconclusive. Previous studies conducted on Gettier Intuitions have demonstrated inconsistent results and non-ideal experimental designs (e.g., unpowered samples, lack of control conditions) leading to few confident conclusions about knowledge attribution in Gettier Cases. For example, Machery et al. (2015) presented some participants with a Gettier Case involving a man and his wife at the hospital. They presented other participants with a control case (i.e., a case where the protagonist

was right for the correct reasons) about a man in a furniture store. Because the vignettes used by Machery et al. (2015) varied both in terms of "case" and in terms of situation and protagonists, we cannot know which of these variables was responsible for different rates of knowledge attribution between the two conditions. Given the inconsistent results and limitations of previous studies, further research is required to fully understand how knowledge is attributed in Gettier Cases.

In order to conduct standardized and generalizable research on this phenomenon, the Accelerated Collaboration and Education Research Project (CREP) has been created. The CREP is an international program that seeks to gather reliable psychological evidence through crowdsourced replications. Our lab is one of 28 labs across 4 continents to run a replication of Turri et al. (2015) Experiment #1. The goal of this initial large-scale replication effort is to gather a large sample of generalizable data, in order to clarify the findings of Turri et al. (2015) Experiment #1 and expand the existing research on Gettier Cases.

Extension

In addition to replicating Turri et al. (2015), I have chosen to conduct an extension that goes beyond the focus of the original study. While Gettier argues that knowledge attributions are based solely on the facts of the situation (e.g., was the protagonist just lucky when they got the right answer?), research has also shown that a variety of additional factors (that have little to do with the concrete facts of the situation) can impact how knowledgeable protagonists are seen to be, factors such as physical appearance, attractiveness, and level of education of the protagonist (McDonald & Ma, 2015). Given these findings, I extended the replication of the study to investigate if the level of expertise of the protagonist could influence knowledge attribution in Gettier cases.

Consider the Smith case. Here, Gettier argues that individuals will logically examine the facts of the case and not attribute Smith with knowledge due to the fact that the reasons for his belief are not the actual reasons for why the belief is true. However, imagine if Smith is described as a highly educated individual, dressed professionally, who has expertise in business management. Would these characteristics lead people to attribute Smith with knowledge, even though he still was right for the wrong reasons? There are reasons to expect that they would.

Previous studies have found that if an individual is given an expert title in a particular field, people are more likely to believe their advice and recommend others follow it (Salmerón & Fajardo, 2016). Salmerón & Fajardo (2016) presented undergraduate students with advice in the context of an online forum and examined how likely they would be to recommend that advice to others. They found that the majority of undergraduate students were more likely to recommend the advice of an expert rather than an individual who used a non-expert pseudonym online, despite the fact that the actual advice offered was identical regardless of its source. This research illustrates how an expert title can lead people to trust the expert's beliefs and view them with more credibility than someone with a lay title. Although these authors did not measure knowledge attribution per se, the findings do present a challenge to Gettier's thinking, as they suggest that knowledge attributions are influenced by not only the facts of the situation but also people's perceptions of the protagonist.

This extension of Turri et al. (2015), therefore, aims to study the difference in knowledge attribution of Gettier cases when the protagonist is an Expert vs. a Non-Expert. Given the existing literature, it is predicted that participants will be more likely to accredit expert protagonists with knowledge than non-experts, even in Gettier Cases. This logic is counterintuitive, as Gettier cases are characterized by an individual being correct for the wrong reasons. Theoretically, expertise should not impact how likely an individual is to be correct for

the wrong reasons, as "getting the right answer but for the wrong reasons" is just based on luck. Due to the fact that individuals are more likely to trust expert sources over lay sources (Salmerón & Fajardo, 2016), and that non-factual variables can be involved in knowledge attribution (McDonald & Ma, 2015), it is hypothesized that expert titles will sway participants to attribute protagonists with more knowledge than they would attribute to protagonists with lay titles.

The following experiments will use the three original vignettes of Turri et al. (2015) as the Expert Conditions. These conditions will be analyzed and compared to the original study to see if the original findings are replicable. An additional set of three vignettes will be closely based off the original vignettes, including only a modification that changes the protagonist's title to Non-Expert. These conditions will be analyzed and compared to the Expert conditions to examine if expertise can have an influence on knowledge attributions.

Experiment 1

Method

Experiment 1 tested the effect of expertise on knowledge attribution in the case of a salient but failed threat to the truth of a belief. This experiment utilized materials from and followed instructions in the CREP Registered Replication Report (RRR): Turri, Buckwalter, & Blouw (2015). This study differed from the RRR by including three Non-Expert Conditions to measure my additional variable of expertise.

Participants

350 participants (160 female, 184 male, 1 no indication, 3 other) were recruited using Amazon's Mechanical Turk (MTurk), an online subject recruitment system. Participant age ranged from 19-73 (M=38 years, SD=11.85). The majority of participants were from the United States (336) while 6 were from Canada, 6 from the United Kingdom and 2 from Other countries. 250 participants identified as Caucasian, 39 as Black, 24 as Asian, 24 as Hispanic, 2 as American

Indian and 11indicated another response or did not indicate an ethnicity. Individuals participated voluntarily and received $0.60 for their participation. A total of 41 participants were excluded from the study, 38 because they failed comprehension check questions (e.g., they provided incorrect responses when asked to report on details of their assigned condition), and 3 because they were found to have an idea of what the study was testing. All statistical tests reported below were conducted both excluding and including data from these participants. Results were similar in both cases and so for clarity of presentation only the results when participants were excluded are reported below.

Design

Experiment 1 tested two independent variables: Propositional knowledge and Protagonist expertise. The propositional knowledge variable consisted of three levels: Knowledge Control, Gettier, and Ignorance Control. The Protagonist expertise variable had two levels: Expert and Non-Expert. These variables were fully crossed to produce 6 total conditions (i.e. Expert, Knowledge Control; Expert, Gettier; Expert Ignorance Control; Non-Expert Knowledge Control; Non-Expert, Gettier; Non-Expert, Ignorance Control). Participants were randomly assigned one of the six possible conditions.

The first dependent variable was rate of knowledge attribution. Participants were posed the question: *"Darrel _____ (only believes/ knows) that there is at least one red speckled ground squirrel in Zone 3 today."* Participants were asked to rate on a scale from 0, indicating "only believes", to 100 meaning "knows" in order to measure their opinion on the protagonist's level of knowledge.

The second dependent variable was ability (or inability) versus luck (good/bad). Participants were asked: *"Darrel got the [right/ wrong selected answer from previous question] answer because of his _____."* Participants then rated on a scale of 0 ([in] ability) to 100

([good/bad] luck) to measure why they believed the protagonist got the right or wrong answer (inability/ bad luck if wrong answer was perceived, ability/ good luck if right answer was perceived).

Materials

This study followed all protocols of the CREP project which involved using the exact manipulations and outcome variable questions reported in Turri et al. (2015), using continuous visual analogue scales. The CREP team chose to modify the original study, which measured its dependent variables using binary responses (two answer options per question) to visual analog scales (0-100 sliding scale) in hopes of gathering more exact responses to the dependent variable questions that could be interpreted across a continuum of values, rather than distinct responses. All Expert Condition materials were taken directly from the Registered Replication Report: Turri, Buckwalter, & Blouw (2015) manuscript. All Non-Expert conditions utilized my original modified vignettes.

This study had six conditions. Three of the vignettes were the exact same from Turri et al. (2015) and 3 modified the existing vignette to add the additional variable of expertise.

The original expert condition vignettes all began the same way:

> Darrel is an ecologist collecting data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3. While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

The non-expert conditions began slightly different, then followed the same ending:

> Darrel is a citizen scientist who has received basic training on cataloging animals. Citizen scientists like Darrel are amateur scientists; people who do not have any formal scientific training but who volunteer their time to help with scientific research. Today, he is volunteering to collect data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3….

From there, each of the knowledge attribution conditions varied in their ending (Expert/ Non-Expert):

Knowledge Control:

> Ecologists are/ Darrel is unaware that a complex network of aquifers recently began drying up in parts of the park. These aquifers carry vital nutrients to the trees and other forms of plant life that support the squirrels. And the aquifers in the river valley running through Zone 3 are no exception. The animal Darrel is looking at is indeed a thirsty red speckled ground squirrel.

Gettier Case:

> Ecologists are/ Darrel is unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. Still, the animal Darrel is looking at is indeed a red speckled ground squirrel.

Ignorance Control:

> Ecologists are/ Darrel is unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. And, the animal Darrel is looking at is indeed one of the prairie dogs.

Complete versions of these vignettes can be found in Appendix A.

In adherence with CREP procedures, this experiment followed the specific debriefing procedure explained in the Registered Replication Report: Turri, Buckwalter, & Blouw (2015) manuscript. This procedure involves gathering demographic information about the participants in addition to asking open-ended questions such as “What do you think is the purpose of this study?”, “What was your impression of the materials in this study?”, “Have you ever participated in a similar study? If yes, please describe the study.” Responses to these questions will be used to evaluate participant awareness of the hypotheses of the study for purposes of exclusion.

Procedure

Participants took the study individually and online using Qualtrics Software. Upon beginning the study, the participants were given an informed consent form where they were told they are going to participate in a study that involves thinking about human behavior. Once

consenting, participants were taken to an instruction screen that told them they will read a passage and then will be asked to answer some questions.

After providing their consent, Qualtrics randomly directed participants to one of the six experimental conditions. Once the participants read the passage about Darrel, they were asked to respond to six questions about the vignette that measured knowledge attribution, comprehension, and reasonability. These questions used a combination of visual analog scales and binary response options in accordance with the Registered Replication Report: Turri, Buckwalter, & Blouw (2015). As per the Turri et al. (2015) study, participants were not able allowed to return to previous pages to reread or change their answers.

Once all of questions for each vignette were answered, participants were then asked to answer a set of demographic, control, covariate, and study experience questions as per the CREP protocol. Specific demographic information such as the participant race, years of education, age, country of residence, country of origin, and gender were collected. Next, participants were asked funneled debriefing questions in order to assess their awareness of the purpose and hypotheses of the study along with their perception of their study experience.

After completing the debriefing questions, participants were taken to the final debriefing screen that explained the goals and hypotheses of the study. Participants were given the information of people they may reach to ask any questions they have and were thanked for their participation.

Results

We ran a 3 (Propositional knowledge condition) x 2 (Expertise condition) ANOVA for each dependent variable in order to find the main effect of expertise, the main effect of condition, and the interaction between the two independent variables.

Knowledge Attribution Probe

"Darrel _____ (0=only believes/ 100=knows) that there is at least one red speckled ground squirrel in Zone 3 today."

Figure 1 demonstrates how the Knowledge Control condition was attributed with the most knowledge, (*M*=83.64, *SD*=25.03 for Experts and *M*=73.77, *SD*= 34.6 for Non-Experts) followed by the Gettier Condition (*M*=71.22, *SD*=34.4 for Experts and *M*=60.13, *SD*= 36.04 for Non-Experts) and the condition attributed with the least amount of knowledge was the Ignorance control (*M*=34.93, *SD*=36.03 for Experts and *M*=34.04, *SD*= 39.61 for Non-Experts). As predicted, assignments to propositional knowledge conditions significantly affected rates of knowledge attribution, F (2,304) =43.86, $p<.001$, partial eta squared =.224. Post hoc tests utilizing the Bonferroni Correction demonstrated that each of the three conditions differed significantly from one another at the .05 significance level. The knowledge control condition was attributed with the most knowledge, followed by Gettier and Ignorance Control, mirroring the results of the original study.

As can be seen in Figure 1, the mean rate of knowledge attribution in the Expert conditions were slightly higher than the Non-Expert conditions. In the Knowledge Control conditions, Experts (*M*=83.64, *SD*=25.03) were attributed more knowledge than Non-Experts (*M*=73.77, *SD*=34.6). In the Gettier condition, the mean rate of knowledge attribution for experts was *M*=71.22 (*SD*=34.04) whereas in the Non-Expert condition, it was *M*=60.13 (*SD*=36.04). In the Ignorance Control condition, Experts (*M*=34.93, *SD*=36.03) were attributed more knowledge than Non-Experts (*M*=34.04, *SD*= 39.61). Therefore, there was a marginal effect of expertise, F (1, 304) = 3.42, $p<.07$, partial eta squared=.011.

In this analysis, we looked at whether the effect of propositional knowledge condition was the same for Expert vs. Non-Expert protagonists. As Figure 1 shows, the Expert Condition

was viewed as having more knowledge than the Non-Expert condition across each propositional knowledge condition (Knowledge Control, Gettier and Ignorance Control). The Expert protagonists were attributed with knowledge at mean rates of *M*=84.64, 71.22 and 35.93 for the Knowledge Control, Gettier and Ignorance Control conditions respectively. The Non-Expert protagonists were attributed with knowledge at mean rates of *M*=73.77, 60.13 and 34.04 for the Knowledge Control, Gettier and Ignorance Control conditions respectively. The rates of knowledge attribution across the propositional knowledge conditions did not significantly differ from the rates of knowledge across propositional knowledge conditions for Non-Experts. Therefore, the interaction between expertise and condition was not significant, *F* (2,304) =.67 *p*=.51, partial eta squared =.004. The effect of expertise was not dependent on the condition assigned and vice versa.

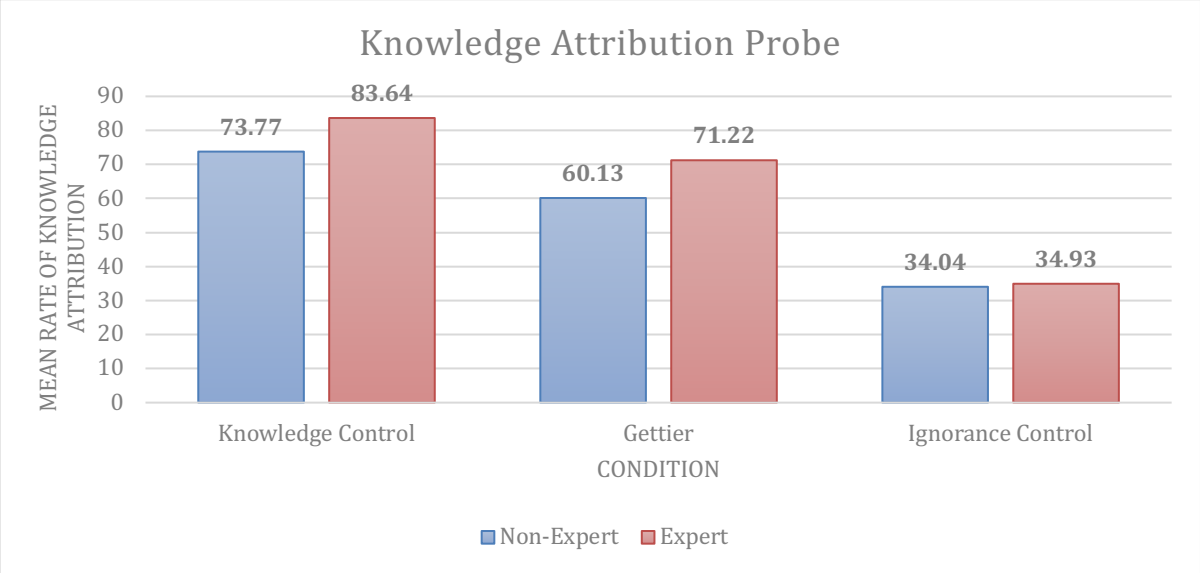

Figure 1. Mean rate of knowledge attribution scores (0=only believes, 100= knows).

(In)ability/ (Good/Bad) Luck Probe

"Darrel got the [selected answer from previous question] answer because of his _____. (0=(in)ability/ 100=(good/bad) luck"

Figure 2 shows that the Knowledge Control condition was attributed with the most ability, (*M*=43.74, *SD*=34.78 for Experts and *M*=33.02, *SD*= 29.11 for Non-Experts) followed by the Gettier Condition (*M*=38.11, *SD*=33.64 for Experts and *M*=48.91, *SD*= 32.21 for Non-Experts) and the condition attributed with the least amount of knowledge was the Ignorance control (*M*=49.27, *SD*=29.068 for Experts and *M*=39.94, *SD*= 34.41 for Non-Experts. The main effect of propositional knowledge conditions was not significant, *F* (2,304) = 1.06, *p*=.35, partial eta square= .007. Propositional knowledge conditions did not significantly influence how much ability or luck participants viewed Darrel to possess.

Figure 2 shows that, there was little variation between Expert and Non-Expert rates of ability or luck. In the Knowledge Control condition, Experts (*M*=43.74, *SD*=34.78) were attributed with more luck than Non-Experts (*M*=33.02, *SD*= 29.11). In the Gettier condition Experts were attributed with more ability (*M*=38.11, *SD*=33.64) than Non-Experts (M=48.91, *SD*=32.21). In the Ignorance Control condition, Experts (*M*=49.27, *SD*=29.068) were viewed as getting the answer wrong more due to bad luck, than Non-Experts (*M*=39.9, *SD*= 34.41). The main effect of expertise was not significant, *F* (1,304) = .71, *p*=.40, partial eta square=.002. Expertise condition did not significantly influence how much ability or luck participants viewed Darrel to possess.

In this analysis, we looked at whether the effect of propositional knowledge condition was the same for Expert vs. Non-Expert protagonists. As Figure 2 shows, the Expert protagonists were attributed with ability at mean rates of *M*=43.74, 38.11, 49.27 for the Knowledge Control, Gettier and Ignorance Control conditions respectively. The Non-Expert protagonists were attributed with ability at mean rates of M=33.02, 48.91 and 39.9 for the Knowledge Control, Gettier and Ignorance Control conditions respectively. As Figure 2 shows, the Expert Condition was slightly viewed as getting the answer right more due to luck in the Knowledge and

Ignorance Control conditions. However, in the Gettier condition, Experts were more likely to be viewed as getting the answer right due to their ability, whereas Non-Experts were viewed as getting the answer right due to luck. Additionally, in the Ignorance Control condition, the trend shows participants viewed Experts as getting the answer incorrect due to luck and Non-Experts as getting the answer incorrect due to inability, as visible in Figure 2. The interaction between expertise and propositional knowledge condition was significant, F (2,304) = 3.67, p<.03, partial eta square=.024. Pairwise comparisons were conducted to determine the precise nature of the interaction to examine the effect of expertise separately within each of the knowledge conditions.

The pairwise comparison of the effect of expertise on the Knowledge Control condition was marginally significant, F (1,96) =2.73, p=.10, partial eta squared=.028. As visible in Figure 2, participants showed a trend to view Experts as giving the right judgment more to their ability than Non- Experts.

The effect of expertise on ability or luck judgement in the Gettier Condition was not significant, F (1,106) =2.90, p=.09, partial eta square=.027. Though not significant, participants showed a trend to view Non-Experts as giving the right judgment more because of their ability whereas experts are seen as getting the right answer more due to luck.

The effect of expertise on ability or luck judgement in the Ignorance Control Condition was significant, F (1,102) =2.248, p=.022. Participants differed significantly when accrediting knowledge to luck or ability in the Ignorance Control condition, trend shows participants viewed Experts as getting the answer incorrect due to bad luck and Non-Experts as getting the answer incorrect due to inability, visible in Figure 2.

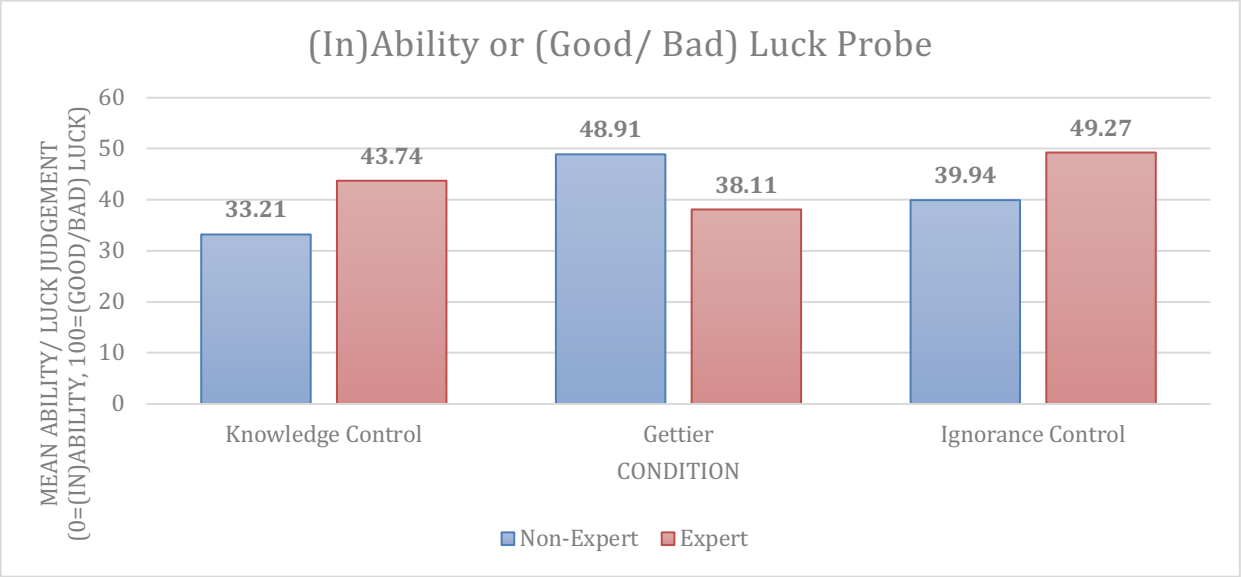

Figure 2. Mean rate of reasonability scores (0=(in)ability, 100=(good/bad) luck).

Discussion

In order to evaluate how the findings of Experiment #1 compared to Turri et al. (2015), we first looked at the results of the Expert conditions for the knowledge attribution and reasonability dependent variables as those were the only questions asked in the original study.

For the dependent variable of knowledge attribution, our study showed the same trend as the original, with the Knowledge Control overwhelmingly viewed as a case of knowledge, the Ignorance Control overwhelmingly viewed as a case of mere belief and the Gettier case falling in the middle, leaning more toward knowledge attribution.

In order to evaluate my additional variable of expertise, we compared the results of the Non-Expert and Expert conditions. In regard to knowledge attribution, we found that participants showed a trend of viewing the Expert protagonist as more knowledgeable than the Non-Expert. For the ability/ luck dependent variable, we found an interaction between expertise and condition for the ability and luck dependent variable that showed in Knowledge Control conditions, Experts are more likely to get their answer correct due to ability. In Gettier conditions, Non-experts were more likely to get their answer right to ability. In Ignorance Control conditions,

Experts were more likely to be viewed as getting the answer incorrect due to bad luck and Non-Experts as getting the answer incorrect due to inability, demonstrating how expertise can influence how reasonable participants viewed the protagonist's beliefs.

Overall, the findings of Experiment #1 showed that participants were more likely to accredit knowledge to Experts than to Non-Experts. In addition, the results of this study are consistent with the results of the original study that found that when presented with a Gettier Case of a noticeable but failed threat to the truth of a belief people still attribute knowledge to the protagonist. This result directly opposes Gettier's suggestion, that lay people solely contemplate the facts of the situation when attributing knowledge.

These findings are interesting because this experiment changed the style of measurement of the dependent variables in the original study from binary responses to visual analog scales following Turri et al. (2015)'s recommendations for further research. With the visual analog unit of measurement in this study, many moderate trends were found in relation to how expertise influences knowledge attribution, but not many significant results. When thinking further about this, we gathered that it may be possible that the visual analog scales provided too much room for variation among responses. Perhaps, if the participants had fewer options to choose from, they would be required to more decisive when attributing an individual with knowledge, reasonableness or ability and potentially lead to more significant findings. Though the authors of the RRR believed that the visual analog scales would elicit more precise findings, we decided to run another experiment following the original design of Turri et al. (2015) using binary response options for the dependent variables. The goals of Experiment #2 are to further explore how expertise influences attributions of knowledge and to conduct a more accurate and direct replication of the Turri et al. (2015) by using the original measurement style.

Experiment 2

Experiment 2 tested the effect of expertise on knowledge attributions in the case of a salient but failed threat to the truth of a belief. This experiment followed all instructions in from the original study, Turri et al. (2015), which used binary response options for the knowledge and ability probes, rather than visual analog scales used in Experiment #1. This experiment aimed to evaluate the differences in results when using binary measurements of the dependent variables rather than visual analog scales. We hypothesized that more significant results would be found when using binary response options than visual analog scales due to participants being "forced" to make a clear choice between two distinct options.

Method

Participants

352 participants (210 female, 139 male, 3 no indication) were recruited using Amazon's Mechanical Turk (MTurk), an online subject recruiting system. Participant age ranged from 19-81 (M=36.37 years, SD= 12.45). The majority of participants were from the United States (332) while 13 were from Canada, and 7 from the United Kingdom. 257 participants identified as Caucasian, 27 as Black, 24 as Asian, 19 as Hispanic, 2 as American Indian and the rest as multi-racial or other. Individuals participated voluntarily and received $0.60 for their participation. A total of 18 participants were excluded from the study, two of whom were found to have an idea of what the study was testing and 16 because they failed comprehension check questions (e.g., they provided incorrect responses when asked to report on details of their assigned condition). All statistical tests were conducted both excluding and including data from these participants. Results were similar in both cases and so for clarity of presentation only the results when participants were excluded are reported below.

Design

Experiment 2 mirrored the exact design of Experiment 1.

Materials

This study followed the protocols of the CREP project, but used the exact manipulations reported in Turri et al. (2015), rather than the visual analog scales. This study used the same six conditions as described in Experiment #1. All debriefing questions, materials and procedure are the same as Experiment #1.

Procedure

The procedure of Experiment 2 modeled the exact procedure of Experiment 1 with one change: the knowledge attribution, and ability/ luck probes utilized binary response options rather than visual analog scales in accordance with the original study, Turri et al. (2015). For example, in the knowledge attribution probe, participants could only choose from two multiple choice options, "knows" or "only believes." For the Ability/ Luck probe, participants chose between (in)ability and (good/ bad) luck depending on their response to the right/ wrong answer probe. All other procedures are the same as Experiment #1.

Results

In a similar fashion as Experiment #1, we ran a 3 (Knowledge condition) x 2 (Expertise condition) ANOVA for each dependent variable in order to find the main effect of expertise, the main effect of condition, and the interaction between the two independent variables.

Knowledge Attribution Probe

"Darrel _____ (only believes/ knows) that there is at least one red speckled ground squirrel in Zone 3 today."

Figures 3 and 4 show that the Knowledge Control condition was attributed with the most knowledge 83% for Experts and *M*=71% for Non-Experts) followed by the Gettier Condition (63% for Experts and *M*=66% for Non-Experts) and the condition attributed with the least amount of knowledge was the Ignorance control (34.6% for Experts and *M*=25.9% for Non-

Experts). In accordance with Experiment #1 and as predicted, assignments to propositional knowledge conditions significantly affected rates of knowledge attribution, F (2,334) =30.388, p<.001. Post hoc tests utilizing the Bonferroni Correction demonstrated that the Ignorance Control condition significantly differed from both the Knowledge Control condition p<.002 and the Knowledge Control and Gettier conditions approached significant difference p=.056. These findings closely resemble those of the original study.

As can be seen in Figures 3 and 4 there was little difference between the Expert and Non-Expert conditions. Knowledge Control more participants attributed Experts (83%) with knowledge than Non-Experts (71%). In the Gettier Condition, more participants viewed Non-Experts (66%) with more knowledge than Non- Experts (63%). In the Ignorance Control condition, Experts (34.6%) were viewed as having more knowledge than Non-Experts (25.9%). The effect of expertise was not significant, F (1, 334) = 1.573, p=.221. Participants showed no significant difference in knowledge attributions in the Expert and Non-Expert conditions.

In this analysis, we looked at whether the effect of propositional knowledge condition was the same for Expert vs. Non-Expert protagonists. As Figures 3 and 4 show, the Expert Condition was viewed as having more knowledge than the Non-Expert condition in the Knowledge Control and Ignorance Control conditions. However, in the Gettier condition, 66% of participants believed Non-Experts had knowledge while only 63% thought Experts possessed knowledge. The rates of knowledge attribution across the propositional knowledge conditions did not significantly differ from the rates of knowledge across propositional knowledge conditions for Non-Experts. The interaction between expertise and condition was not significant, F (2,334) =.911 p=.403. The effect of expertise was not dependent on the condition assigned and vice versa.

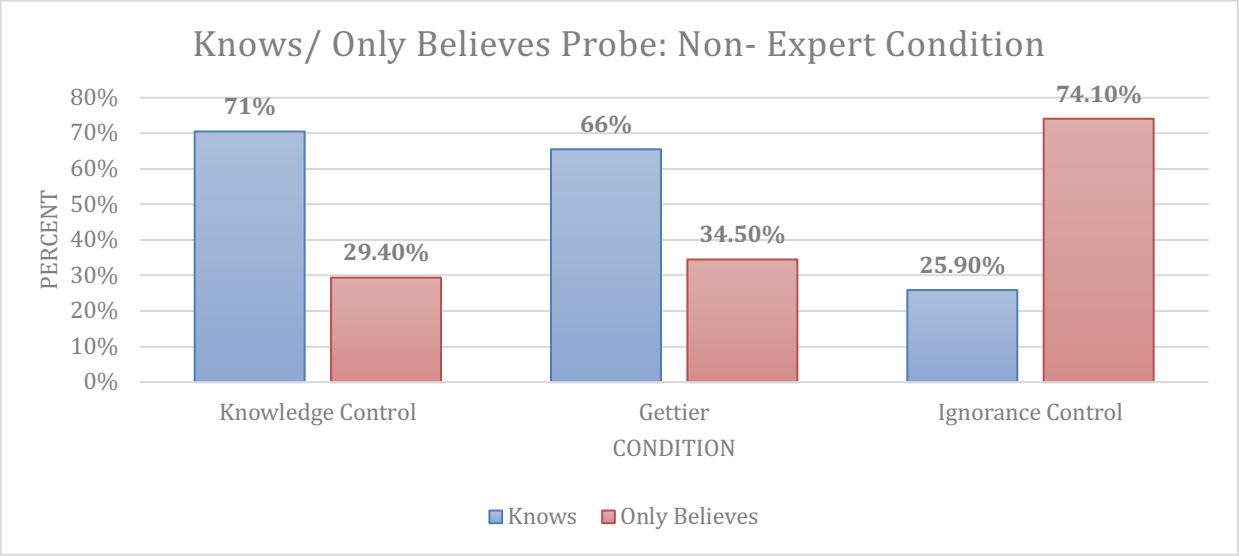

Figure 3. Percent of participants in the Non-Expert condition who viewed Darrel as "knowing" versus "only believing" by condition.

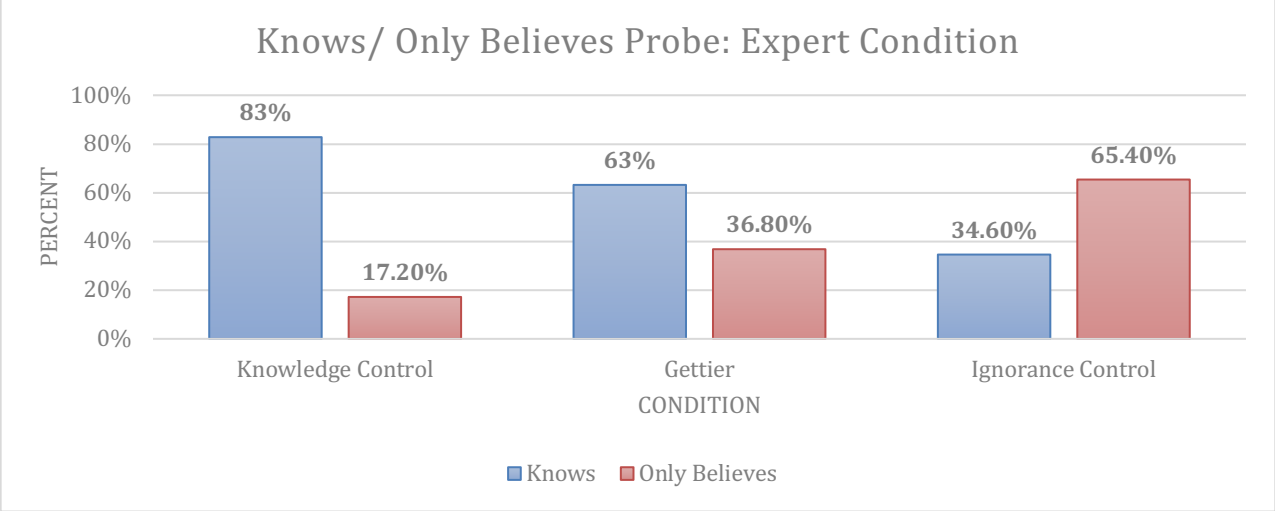

Figure 4. Percent of participants in the Expert condition who viewed Darrel as "knowing" versus "only believing" by condition.

(In)ability/ (Good/Bad) Luck Probe

As Figure 5 depicts, in the Knowledge Control, the majority participants accredited Darrel's correctness to his ability (94% of participants for Experts, 80.4% of participants Non-Experts). In the Gettier condition, participants accredited is correctness to his ability (73.7% of

participants for Experts, 77.7% of participants Non-Experts), but significantly less than the Knowledge control. In the Ignorance Control, participants accredited Darrel's wrong response due to inability for Non-Experts (60.3%) and 50% due to ability and 50% due to luck for Experts. The main effect of propositional knowledge conditions was significant, F (2,334) = 17.024, p<.001. Propositional knowledge conditions significantly influenced how much ability or luck participants viewed Darrel possessed with each of the propositional knowledge conditions differing significantly from one another.

Figure 2 shows that, there was little variation between Expert and Non-Expert rates of ability or luck. In the Knowledge Control condition, Experts (M=43.74, SD=34.78) were attributed with more luck than Non-Experts (M=33.02, SD= 29.11). In the Gettier condition Experts were attributed with more ability (M=38.11, SD=33.64) than Non-Experts (M=48.91, SD=32.21). In the Ignorance Control condition, Experts (M=49.27, SD=29.068) were viewed as getting the answer wrong more due to bad luck, than Non-Experts (M=39.9, SD= 34.41). The main effect of expertise was not significant, F (1,304) = .71, p=.40, partial eta square=.002. Expertise condition did not significantly influence how much ability or luck participants viewed Darrel to possess.

Figure 5 there was little variation between Expert and Non-Expert rates of ability or luck. In the knowledge control condition, more Experts (95%) were attributed with more ability than Non-Experts (80.4%). In the Gettier case condition, more Non-Experts (77.8%) were attributed with ability than Experts (73.57). In the Ignorance Control Condition, more Non-Experts (60.3%) were attributed with ability than Experts (50%). The main effect of expertise was not significant, F (1,334) = .007, p=.934. Expertise condition did not significantly influence how much ability or luck participants viewed Darrel to possess.

In this analysis, we looked at whether the effect of propositional knowledge condition was the same for Expert vs. Non-Expert protagonists. As Figure 5 shows, the Non- Expert protagonists were attributed with ability at mean rates of 80.4% for Knowledge Control, 77.8% for Gettier and 60.3% Ignorance Control conditions respectively. The Expert protagonists were attributed with ability at mean rates 95% for Knowledge Control, 73.7% for Gettier and 50% for Ignorance Control conditions respectively. The interaction between expertise and propositional knowledge condition was marginal, F (2,334) = 2.437, p=.089.

Figure 5 shows that in the Knowledge Control condition, 95% of participants viewed the Expert protagonist as getting his answer correct due to ability while only 80.4% of participants accredited the Non-Expert's correct response due to ability. The pairwise comparison of the effect of expertise in the Knowledge Control condition was significant F (1,109) =5.167, p<.05. In the Knowledge Control condition where Darrel was correct, participants were more likely to accredit the Expert's correct response due to ability, Non-Experts correct responses were more judged as being due to luck.

In the Gettier condition, Figure 5 shows that 77.8% of participants accredited the Non-Expert's correct response due to ability whereas 73.7% of participants accredited the Expert's correct response to ability. The effect of expertise on ability or luck judgement in the Gettier Condition was not significant, F (1,110) =.305, p=. 582. Participants did not significantly differ when accrediting knowledge to luck or ability in the Gettier condition, participants showed trend to accredit correctness more toward ability for both Experts and Non-Experts.

Figure 5 depicts how in the Ignorance Control condition, 60.3% of participants attributed the Non-Experts wrong answer due to inability whereas 50% of participants attributed the Expert's wrong answer due to inability and 50% attributed it to bad luck. The effect of expertise on ability or luck judgement in the Ignorance Control Condition was not significant, F (1,108)

=1.179, *p*=.280. Participants did not significantly differ when accrediting knowledge to luck or ability in the Ignorance Control condition.

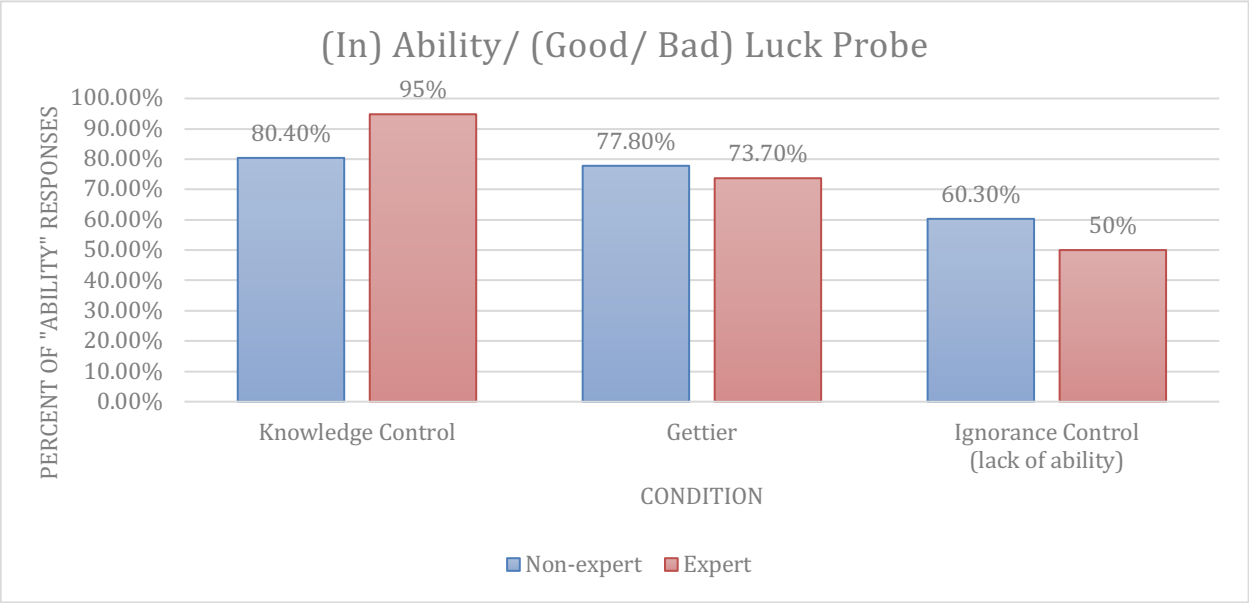

Figure 5. Percent of participants who believed Darrel got the answer due to his "ability" (or lack thereof) by condition.

Discussion

In a similar fashion as Experiment #1, we first looked at the results of the Expert conditions for the knowledge attribution and reasonability dependent variables and compared them to the original study to see if they findings of Turri et al. (2015) were able to be replicated.

For the dependent variable of knowledge attribution, the results of Experiment #2 closely resemble the findings the original study. In both Experiment #2 and in the original study, the Ignorance Control differed significantly from the Knowledge Control and Gettier conditions but the Knowledge Control and Gettier conditions did not significantly differ. Overall, the Knowledge Control and Gettier conditions show the same trend as the original study and Experiment #1, with both conditions attributed with knowledge above the rate of chance.

In order to evaluate my additional variable of expertise, we compared the results of the Non-Expert and Expert conditions across each of the dependent variables. As in Experiment #1,

we found that participants showed a slight trend of viewing the expert protagonist as more knowledgeable than the non-expert, but not a significant effect. Lastly, for the ability/ luck dependent variable, in accordance with the trend found Experiment #1, we found a marginal interaction between expertise and condition was discovered particularly in the Knowledge Control condition where participants were significantly more likely to accredit the Expert's correct response due to ability and accredit the Non-Experts correct responses were as being more due to good luck.

Overall, the findings of Experiment #2 mirrored the results of Experiment #1 in showing that that participants were more likely to accredit knowledge to Experts than to Non-Experts. In addition, many of the findings in Experiment #2 were consistent with the results of the original study. This finding is important as it strengthens the reliability of the original study's results due to the fact that the Expert conditions of Experiment #2 directly replicated the original study. Experiment #1, Experiment #2 and Turri et al. (2015) all found that when presented with a Gettier Case of a noticeable but failed threat to the truth of a belief people still attribute knowledge to the protagonist, directly opposes Gettier's suggestion, that lay people solely contemplate the facts of the situation when attributing knowledge.

Contradictory to our hypothesis, changing the style of dependent measure variable in Experiment #2 did not produce more significant results than Experiment #1. This can be seen in the Knowledge attribution probes for each experiment. In Experiment #1, there was a marginal effect of expertise, where Experts were seen as more knowledgeable than Non-Experts, $p<.07$. In Experiment #2, no significant difference in knowledge attribution was found between the Expert and Non-Expert conditions, $p=.221$. This can also be seen in the Gettier conditions of the Ability/ Luck probes in both experiments. Experiment #1 found that Non-Experts showed a trend of being viewed as getting their answer more due to ability than Experts $p=.09$. Experiment #2

found that participants did not significantly differ between Experts and Non-experts, showing a pattern of accrediting both conditions toward ability p=.582. In these cases, the findings from the visual analog scales are much closer to approaching significance than those using binary responses, demonstrating how varying styles of measurement for dependent variables can significantly influence results.

General Discussion

Being able to judge whether an individual is knowledgeable on a topic or not is a critical skill for humans to possess. Once an individual is attributed with knowledge, the way in which others perceive and act toward them changes. For example, whether or not an individual knows an action is unacceptable influences whether they are punished for it (e.g. if an infant accidently hits another individual, they would not be severely punished for that behavior because they do not know any better; Malle & Nelson, 2003). Given the critical implications of attributing individuals with knowledge, philosophers have struggled for thousands of years to answer the question, "How do we decide whether an individual truly 'knows' something?" While the Justified True Belief Theory attempts to establish conditions for "true knowledge" to be met, Gettier cases are examples of situations that meet the Justified True Belief criterion but do not warrant true knowledge attribution. Numerous studies have been conducted in efforts to better understand such cases, however, the effect of luck on knowledge attributions is still not well understood. In order to expand the field of research on this topic, this study conducted two experiments with two main goals. The first goal was to determine if the findings in Turri et al. (2015) were replicable. The second was to examine the effects of an additional variable that has not yet been studied in relation to Gettier cases: expertise.

In regard to the first goal of replicating Turri et al. (2015), both Experiment #1 and Experiment #2 demonstrated that the results of the original study were able to be replicated.

Turri et al. (2015) tested two critical dependent variables: knowledge attribution and reasonability. In regard to the former, Experiment #1 showed the same trend as the original study. Both studies found that the Knowledge Control condition was overwhelmingly viewed as a case of knowledge, the Ignorance Control condition was overwhelmingly viewed as a case of mere belief and the Gettier case fell in the middle of the two, leaning more toward knowledge attribution than mere belief. In a similar fashion, Experiment #2 directly replicated the findings the original study. In both Experiment #2 and in the original study, the Ignorance Control condition differed significantly from the Knowledge Control condition and Gettier conditions. The Knowledge Control and Gettier conditions did not significantly differ but showed the same trend as the original study and Experiment #1, with both conditions attributed with knowledge above the rate of chance. This finding is particularly interesting as Experiment #2 directly replicated the original study and produced the same findings. These results support the claim of Turri et al. (2015) that when presented with a Gettier Case of a noticeable but failed threat to the truth of a belief, people tend to attribute knowledge to the protagonist.

This study also addressed its second goal of examining the effect of expertise on Gettier cases. Overall, we found that participants showed a slight trend of viewing the expert protagonist as more knowledgeable than the non-expert, but not a significant effect in either Experiment #1 and Experiment #2. Furthermore, in Experiment #1 we found a trend and in Experiment #2, we an interaction, between expertise and condition for the ability and luck dependent variable. These findings suggest that expertise can potentially influence how participants viewed the reasons behind the protagonist's beliefs in each of the propositional knowledge attribution conditions.

These results lead to a few potential implications. In unison with the original study, these results suggest that a silent but failed threat to the truth of a judgement (a Gettier case) does not significantly affect whether the protagonist is viewed as having knowledge. When an individual

may have just gotten lucky by being right, (e.g., is right for the wrong reasons) individuals still tend to attribute them with knowledge. My additional variable of expertise sheds light on this implication as well. Overall, participants showed a pattern of viewing Experts as more knowledgeable than Non-Experts. One finding in particular that was interesting was in Experiment #1, which found that Experts were generally attributed with more knowledge and more reasonability than the Non-Experts, even in the Gettier case. This result suggests that individuals may give more knowledge to Experts, even when they are right for the wrong reason, simply based off their expert title. As a society, we tend to believe and follow individuals with advanced degrees or training in various fields as they are perceived as having more knowledge than lay individuals (Salmerón & Fajardo, 2016). However, this blind-faith in Experts could potentially be detrimental as knowledge can be mistakenly attributed to them, even though they are right for the wrong reasons.

This study included a few limitations that should be considered. Primarily of concern is this study's utilization of Amazon's MTurk to recruit and test participants. The online nature of this recruiting system gives way to risk of recruiting participants unsuitable for the study (e.g. non-native English speakers, unmotivated participants). Though this study took all measures to remove suspicious participants, there is the potential that some bypassed the checks and were still included in the analyses. In addition, this study utilized only one Gettier case vignette. It is possible that the findings of Turri et al. (2015) and in this paper are solely specific to the Darrel the Ecologist vignette and not any other Gettier cases. Lastly, these experiments only tested binary and visual analog scale operationalizations of the dependent variables, perhaps there is more accurate way to measure these dependent variables such as a Likert scale.

With the aforementioned limitations in mind, there are a few potential future directions for this research. The first is to gather more evidence on the expertise independent variable. This

study is the first to examine the effect of expertise on knowledge attribution in Gettier cases and therefore serves as a pilot study. I have proposed this extension to the rest of the CREP team in order to gather a larger amount of data from reliable sources on this variable in order to increase the generalizability of the results. Another modification I suggest is adding more vignettes to the study which consist of both Expert and Non-Expert conditions to evaluate if the findings of Turri et al. (2015) and this study are unique to the Darrel vignette or generalizable to other Gettier cases. Lastly, due to the fact that this study demonstrated differences in results between the binary responses and the visual analog scales, this study suggests exploring different scales such as the Likert scale to test how various operationalizations of the dependent variables can influence results.

In conclusion, the results of this study provided information that replicated the findings of Turri et al. (2015) and explored the potential influence of expertise on knowledge attributions. The replication findings of this study allow researchers to be more confident in the finding of Turri et al. (2015) that individuals do not attribute knowledge in Gettier cases the way Gettier suggested. Rather, lay people seem to attribute knowledge even when protagonists' beliefs are correct simply because they were lucky. The expertise findings of this study provide premaxillary evidence that suggests on expert-titles can influence knowledge attribution. This study adds important findings to the existing field of literature on this subject and provides meaningful directions for future research.

References

Gettier, E. L. (1963). Is justified true belief knowledge? *Analysis, 23*, 121–123.

Machery, E., Stich, S., Rose, D., Chatterjee, A., Karasawa. K., Struchiner, N., Sirker, S., Usui, N., & Hashimoto, T. (2015). Gettier across cultures. *NOÛS*, *51*(3) 645-654.

Malle, B. F., & Nelson, S. E. (2003). Judging mens rea: The tension between folk concepts and legal concepts of intentionality. *Behavioral Sciences & the Law, 21*, 563–580.

Mcdonald, Kyla P., & Lili Ma. (2015). "Dress nicer = know more? young children's knowledge attribution and selective learning based on how others dress." *PLoS One*, *10*(12), 41–13.

Salmerón, L., Gómez, M., & Fajardo, I. (2016). How Students with Intellectual Disabilities Evaluate Recommendations from Internet Forums. *Reading and Writing: An Interdisciplinary Journal*, *29*(8), 1653–1675.

Turri, J., Buckwalter, W., & Blouw, P. (2015). Knowledge and luck. *Psychonomic Bulletin and Review, 22*, 378–390.

Appendix A

Vignette 1 - Original "Darrel" vignette (Turri et al., 2015):

D1 - "Darrel" knowledge control condition:

Darrel is an ecologist collecting data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3. While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

Ecologists are unaware that a complex network of aquifers recently began drying up in parts of the park. These aquifers carry vital nutrients to the trees and other forms of plant life that support the squirrels. And the aquifers in the river valley running through Zone 3 are no exception. The animal Darrel is looking at is indeed a thirsty red speckled ground squirrel.

D2 - "Darrel" Gettier case condition:

Darrel is an ecologist collecting data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3. While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

Ecologists are unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. Still, the animal Darrel is looking at is indeed a red speckled ground squirrel.

D3 - "Darrel" ignorance control condition:

Darrel is an ecologist collecting data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3. While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

Ecologists are unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. And, the animal Darrel is looking at is indeed one of the prairie dogs.

Vignette 2 - "Darrel" Non-Expert Vignette (Turri et al., 2015):

D1 - "Darrel" knowledge control condition:

Darrel is a citizen scientist who has received basic training on cataloging animals. Citizen scientists like Darrel are amateur scientists; people who do not have any formal scientific training but who volunteer their time to help with scientific research. Today, he is volunteering to collect data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3.

While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

Darrel is unaware that a complex network of aquifers recently began drying up in parts of the park. These aquifers carry vital nutrients to the trees and other forms of plant life that support the squirrels. And the aquifers in the river valley running through Zone 3 are no exception. The animal Darrel is looking at is indeed a thirsty red speckled ground squirrel.

D2 - "Darrel" Gettier case condition:

Darrel is a citizen scientist who has received basic training on cataloging animals. Citizen scientists like Darrel are amateur scientists; people who do not have any formal scientific training but who volunteer their time to help with scientific research. Today, he is volunteering to collect data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3.

While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, "At least one red speckled ground squirrel in Zone 3 today."

Darrel is unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. Still, the animal Darrel is looking at is indeed a red speckled ground squirrel.

D3 - "Darrel" ignorance control condition:

Darrel is a citizen scientist who has received basic training on cataloging animals. Citizen scientists like Darrel are amateur scientists; people who do not have any formal scientific training but who volunteer their time to help with scientific research. Today, he is volunteering to collect data on red speckled ground squirrels in Canyon Falls national park. The park is divided into ten zones and today Darrel is working in Zone 3.

While scanning the river valley with his binoculars, Darrel sees a small, bushy-tailed creature with distinctive red markings on its chest and belly. The red speckled ground squirrel is the only native species with such markings. Darrel records in his journal, “At least one red speckled ground squirrel in Zone 3 today.”

Darrel is unaware that a non-native species of prairie dog recently began invading the park. These prairie dogs also have red markings on their chest and belly. When these prairie dogs tried to invade Zone 3, the red speckled ground squirrels were unable to completely drive them away. And the animal Darrel is looking at is indeed one of the prairie dogs.