



# Knowledge-how, Understanding-why and Epistemic Luck: an Experimental Study

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## Abstract

Reductive intellectualists about knowledge-how (e.g., Stanley & Williamson *Journal of Philosophy* 98, 411–44, 2001; Stanley *Noûs* 45, 207–38, 2011a, 2011b; Brogaard *Philosophy Compass* 3, 93–118, 2008a, Grazer *Philosophische Studien* 77, 147–90 2008b, *Philosophy and Phenomenological Research* 78, 439–67 2009, 2011) hold, *contra* Ryle (1946, 1949), that knowing how to do something is just a kind of propositional knowledge. In a similar vein, traditional reductivists about understanding-why (e.g., Salmon 1984; Lipton 2004; Woodward 2003; Grimm *The British Journal for the Philosophy of Science* 57, 515–35, 2006; Greco 2009; Kelp 2014) insist, in accordance with a tradition beginning with Aristotle, that the epistemic standing one attains when one understands why something is so is itself just a kind of propositional knowledge—viz., propositional knowledge of causes. A point that has been granted on both sides of these debates is that if these reductive proposals are right, then knowledge-how and understanding-why should be susceptible to the same extent as knowledge-that is to being undermined by epistemic luck. This paper reports experimental results that test these luck-based predictions. Interestingly, these results suggest a striking (albeit, imperfect) positive correlation between self-reported philosophical expertise and attributions of knowledge-how, understanding-why and knowledge-that which run *contrary* to reductive proposals. We contextualize these results by showing how they align very well with a particular kind of overarching non-reductive proposal, one that two of the authors have defended elsewhere (e.g., Carter and Pritchard *Philosophy and Phenomenological Research* 91, 181–99, 2015a, *Noûs* 49, 440–53, 2015b, *Australasian Philosophical Quarterly* 93, 799–816, 2015c) according to which knowledge-how and understanding-why, but not knowledge-that, essentially involve *cognitive achievement* (i.e., cognitive success that is primarily creditable to cognitive ability). We conclude by situating the interpretive narrative advanced within contemporary discussions about the role of expertise in philosophical judgment.

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## 1 Background and Overview

Two epistemic standings that are the topic of increasing interest in contemporary epistemology are knowledge-how and understanding-why.<sup>1</sup> There is an important point of connection between these two debates: each debate is marked by a divide between what we can call *reductivism* and *non-reductivism*, where the former camp insists that the epistemic standing in question is just a kind of propositional knowledge, and the latter camp denies this claim.<sup>2</sup>

In the case of knowledge-how, the central contemporary dividing line is between *intellectualism* and *anti-intellectualism*. Roughly, the distinction lies in the fact that the former, unlike the latter, holds that knowing how to do something is just a matter of knowing facts.<sup>3</sup> Most contemporary intellectualists (e.g., Stanley and Williamson 2001; Stanley 2011a, b; Pavese (2015, 2017) regard knowledge-how to be itself just a special *kind* of knowledge-that.<sup>4</sup> Anti-intellectualists, accordingly, deny that knowledge-how is a kind of propositional knowledge and thus attempt to show that various properties (linguistic,<sup>5</sup> phenomenological,<sup>6</sup> epistemic,<sup>7</sup> cognitive-scientific,<sup>8</sup> etc.) of knowledge-how and knowledge-that can come apart.

<sup>1</sup> Interest in the former owes in no small part to Stanley and Williamson's (2001) challenge to Ryle's (1946, 1949) famous distinction between knowing-how and knowing-that. Increased interest in understanding-why owes in part to the interest in epistemic value in the past decade, and also to increased collaborations between mainstream epistemologists and philosophers of science interested in scientific understanding and explanation.

<sup>2</sup> Two point of clarification. First, Stanley and Williamson (2001) explicitly deny that their project is one that encourages reducing talk of knowledge-how to talk that does not involve knowledge how. In this very specific respect, they insist that their project is not 'reductive'. But note that this is an entirely different sense of 'reductive' than the one to which we are adverting in distinguishing views that claim that knowledge-how is a *kind* of knowledge-that from views that do not. Their proposal is clearly reductive in the sense in which we are using the term and which is relevant to framing the kind of issues we want to investigate here. Second, note that there is a kind of 'reverse' reductivism on the market, according to which knowledge-that reduces to knowledge-how. See, for example, Hetherington (e.g., Hetherington 2006, 2010); and Hetherington and Lai (2012), who have defended such a position under the description of *practicalism*. We want to be clear that the kind of epistemic luck based objections against reductive views that we will be considering do not also apply, *mutatis mutandis*, to practicalism. The reasons for this are complex, but the crux of the matter is that practicalism, unlike standard reductivist proposals, is not committed to the claim that knowledge-how and knowledge-that must have the same properties.

<sup>3</sup> As Fantl (2014, §0) puts it, the intellectualist claims that 'to know how to do something is just to know the right sort of fact'. Though see Bengson and Moffett (2011a, b) for resistance to this picture. Bengson & Moffett identify themselves as intellectualists in virtue of claiming that propositional attitudes are what *grounds* knowledge-how while denying propositionalism, the thesis that the nature of knowledge-how is an propositional attitude relation. Though Bengson & Moffett's 'nonpropositional' intelletualism, as they call it, is idiosyncratic in this respect. Most contemporary intellectualists embrace propositionalism, along with the thesis that when one knows how to do something this is in virtue of knowledge of facts.

<sup>4</sup> According to Stanley (2011b), for instance, knowing how to  $\varphi$  is a matter of knowing that a certain way is a way to  $\varphi$  under a practical mode of presentation. One expository problem for intellectualists is that it's not entirely clear how practical modes of presentation are supposed to work. See Pavese (*forthcoming*) for a recent comprehensive discussion.

<sup>5</sup> Rumfitt (2003), for instance, argues that the linguistic evidence supports anti-intellectualism. See Stanley (2011b) for a reply.

<sup>6</sup> See, for example, Dreyfus (2005) and Berendzen (2014).

<sup>7</sup> See Poston (2009) and Carter and Pritchard (2015a, 2015b, 2015c) for luck-based arguments. See also Wiggins (2012) for an Aristotelian argument against intellectualism and Hawley (2003) for a non-Rylean version of anti-intellectualism which replaces the role of ability in an account of know-how with counterfactual success.

<sup>8</sup> For some representative discussions, see Noë (2005), Toribio (2008), and Wallis (2008).

Interestingly, there is a very similar and increasingly lively debate taking place in the arena of understanding. One central dividing line, at least amongst epistemologists, concerns whether understanding-why (e.g., as when one understands why the house burnt down) is just a special kind of propositional knowledge—viz., knowledge of (the relevant) causes.<sup>9</sup> Traditional reductivists, following a precedent that owes originally to Aristotle, insist that it is. Non-reductivists (e.g., Pritchard 2009, 2014a; Pritchard, Millar & Haddock, chs. 1–4; Hills 2009; Morris 2012; Grimm 2014), take the opposing view and claim (for different reasons) that understanding-why and knowledge-that can come apart.<sup>10</sup>

There is, however, yet a further and more specific commonality between the two debates. This further point where the two debates parallel one another concerns a specific kind of *epistemologically* oriented argument strategy which has been deployed recently against reductivist proposals of both stripes. Put simply, the idea goes as follows: propositional knowledge (i.e., knowledge-that) is widely regarded by epistemologists to be incompatible with certain kinds of epistemic luck, as Gettier-style cases famously illustrate.<sup>11</sup> Hence if it turns out that knowledge-how and understanding-why differ from knowledge-that that in their respective compatibility with epistemic luck, then this looks like a serious problem for reductivists about knowledge-how and understanding-why, who are committed to predicting otherwise in virtue of regarding these epistemic standings as species of propositional knowledge.

That knowledge-how and understanding-why should (according to reductivist proposals) be compatible with epistemic luck to the same extent as knowledge-that is a point agreed on by critics as well as by defenders of these reductive views. Indeed, Jason Stanley (2011a, 215)—the foremost proponent of contemporary intellectualism about knowledge-how—explicitly recognizes this constraint as legitimate. He remarks that ‘[i]f knowing-how is a species of knowing-that, the properties of knowing-that should be properties of knowing-how’, where he concedes further that these includes purely epistemological properties, such as resilience to undermining epistemic luck.<sup>12</sup> It

<sup>9</sup> For some explicit defences of this view, see Salmon (1984), Woodward (2003), Strevens (2008), Greco (2009) and Sliwa (2015). Note that another important dividing line in the contemporary literature on understanding is between what Kelp (2015) has termed ‘manipulationists’ and ‘explanationists’.

<sup>10</sup> Grimm (2014) thinks of understanding as involving a kind of non-propositional know-how, not reducible to a kind of knowledge-that, though see Pritchard (2014a) for a critique of Grimm’s proposal in this respect. Hills (2009) argues that understanding requires a range of abilities that are unnecessary for possessing propositional knowledge. Pritchard (2009) and Pritchard et al. (Pritchard et al. 2010, chs. 1–4) defends the view that understanding essentially involves cognitive achievement while propositional knowledge does not.

<sup>11</sup> For a recent defence of the claim that knowledge is incompatible with Gettier-style epistemic luck, see Pritchard (2013). For a critical response, see Hetherington (2013). See also Pritchard (2016) for a refinement of this claim, framed in terms of epistemic risk rather than epistemic luck. See Machery et al. (2015) for a study reporting experimental results indicating cross-linguistic and cross-cultural robustness of the Gettier intuition.

<sup>12</sup> This remark was made, specifically, in reply to Poston’s (2009) attempt to show that knowledge-that and knowledge-how are not similarly undermined by Gettier cases. See Carter & Pritchard (2015b) for criticism of Poston’s particular way of making this point. The concession that an intellectualist proposal is committed to regarding the properties of knowledge-how to line up with paradigmatic properties of knowledge-that, it should be pointed out, is not a novelty in Stanley (2011b) and in fact was given explicit expression in Stanley and Williamson (2001), in their remarks that:

“If the special subclass of knowing-that which we call “knowing how” is too dissimilar from other kinds of knowing-that, then one might suspect that we have just recreated the traditional distinction between knowing-how and knowing-that, but in other terms. So it must be that, on our analysis, knowing-how possesses the characteristic features of other kinds of knowing-that.” (Stanley and Williamson 2001, 434)

is hence no surprise that Stanley has attempted to defend his view against the charge that Gettier cases are more difficult to generate for knowledge-how than knowledge-that.<sup>13</sup>

Likewise, in the parallel case of understanding, non-reductivists—such as Kvanvig (2003; 2009), Pritchard (2009, 2014a), Pritchard et al. (2010, chs., 1–4), Morris (2012), and Rowher (2014)—have argued (in different ways) that understanding is compatible with at least some species of epistemic luck that are incompatible with knowledge-that.<sup>14</sup> On this basis, they have claimed that understanding is not a species of knowledge-that.

Our overarching objective in the paper is to assess the extent to which philosophers' as well as non-philosophers' willingness to attribute knowledge-that, knowledge-how and understanding-why are in alignment with what these two reductive proposals are committed to, in particular with respect to the compatibility of epistemic luck with knowledge-how and understanding-why (respectively).

Reductive intellectualists about *knowledge-how* should expect that our practices of ascribing knowledge-how and knowledge-that will align with Hypothesis 1, while antiintellectualists—including two of the present authors: Carter & Pritchard, e.g., 2015a, b, c—should expect otherwise:

**Reductivist Hypothesis 1:** Knowledge-how and knowledge-that are attributed to the same extent in the presence of epistemic luck. (Predicted by reductive intellectualism about knowledge-how).

Accordingly, we tested whether the presence of epistemic luck impacts upon ascriptions of knowledge-that and knowledge-how equally across a range of luck (and corresponding control) vignettes.

Correspondingly, traditional reductivists about *understanding-why* should expect that our practices of ascribing understanding-why and knowledge-that will align with Hypothesis 2, while *non-reductivists* (including Pritchard 2009, 2014a; Pritchard, Millar & Haddock chs. 1–4; Carter and Pritchard 2015a, b, c) should expect otherwise:

**Reductivist Hypothesis 2:** Understanding-why and knowledge-that are attributed to the same extent in the presence of epistemic luck. (Predicted by traditional reductivist accounts of understanding-why).

Accordingly, we tested whether the presence epistemic luck impacts upon ascriptions of knowledge-that and understanding-why equally across a range of luck (and corresponding control) vignettes.

<sup>13</sup> Stanley (2011a, ch. 8). The charge was originally raised in the literature by Poston (2009) and Cath (2011). See Carter and Pritchard (2015a, 2015b, 2015c) for the view that we need to distinguish between different kinds of epistemic luck in this regard—viz., *intervening* epistemic luck (which is incompatible with knowledge-how) versus *environmental* epistemic luck (which, as with knowledge, is compatible with knowledge-how). For discussion of the original distinction between these two kinds of knowledge-undermining epistemic luck, see Pritchard (2009, 2012a, 2015) and Pritchard et al. (Pritchard et al. 2010, chs. 1–4).

<sup>14</sup> See Grimm (2006) and DePaul and Grimm (2007) for an example of the opposing view.

In addition to testing these two hypotheses, we wanted to test for a potential difference in knowledge and understanding ascriptions between participants with expertise in philosophy and (more specifically) in epistemology, and participants without this expertise. The idea for testing for this difference arose after initial pilot studies showed—along with literature that was emerging around the same time (e.g., Turri et al. 2015)—a surprising tendency for participants to attribute knowledge and understanding even in the presence of luck, at least in some circumstances. We hypothesized that greater training in philosophy, as well as greater training in epistemology, would correlate with an increased tendency to deny knowledge in cases involving luck.

Our experimental results revealed, in the main, an interesting disparity in judgments between those with self-reported philosophical training as opposed to those without. Those with no self-reported philosophical training don't respond to the presence of epistemic luck (in comparison with control cases with no luck present) in a way that suggest that they hold that it undermines knowledge-how, understanding-why, or even knowledge-that.<sup>15</sup> Accordingly, those with no self-reported philosophical training attribute knowledge, understanding-why and knowledge-how in a way that is broadly consistent with the hypotheses which both of the two reductivist accounts under consideration would predict, respectively.<sup>16</sup> Surprisingly—and this is a point we'll raise in more depth in the discussion section—one curious result was that those with no self-reported philosophical training were actually *more* likely to attribute knowledge-how in cases where luck was present than in the control cases where it was not. In sum, the results from those with no self-reported philosophical training did not align with what non-reductivists (including the present authors) about knowledge-how and understanding-why should expect.

However, things were very different in the case of those individuals with self-reported philosophical training. Such individuals attribute knowledge-that, understanding-why and

<sup>15</sup> That folk with non-philosophical training attribute knowledge in barn façade style cases (where environmental epistemic luck is present) is a result that has been replicated. See for example Colaço et al. (2014) for a notable version of such a study. Colaço et al also reported an interesting correlation between age and willingness to attribute knowledge in barn façade cases: older individuals were less inclined to attribute knowledge in barn façade cases than younger participants, even though they were just as likely as younger participants to attribute knowledge in the control cases. Furthermore, Colaco et al reported that increasing the number of fakes in the vignettes did not decrease the inclination to attribute knowledge.

<sup>16</sup> The reductivist (about knowledge-how and understanding-why) predicts that there should be no significant difference in susceptibility to being undermined by epistemic luck in case-pairs where knowledge-that is contrasted with know-how and understanding-why. Attribution patterns according to which epistemic luck makes a broadly *uniform* impact on our attribution patterns of knowledge-that, and understanding-why (in comparison with knowledge-that) in such case-pairs will thus be consistent with the predictions of the reductivists. Lack of uniformity here would count against reductivism. That said, it's worth being explicit here that attribution patterns according to which epistemic luck makes a broadly uniform impact on our attributions of knowledge-that, and understanding why (*vis-à-vis* knowledge-that) will be consistent with reductivism regardless of whether the uniform impact of the presence of epistemic luck on our attribution patterns (*vis-à-vis* these respective states) is one that reflects a uniform resilience to being undermined by epistemic luck or a uniform lack of resilience to being undermined by epistemic luck. The prediction being made by the reductivists, as such, is a prediction about uniformity, regardless of the shape the uniformity takes. Thus, given that those with no self-reported philosophical background regarded the three states as insensitive to being undermined by the presence of epistemic luck, we register that the attribution patterns of those with no self-reported philosophical expertise are broadly consistent with the predictions which reductivists proposals of knowledge-how and understanding-why are committed to making.

knowledge-how in a way that runs contrary to what should be expected if either of the reductive proposals is correct. What we found was, in summary, that those with self-reported philosophical training regarded propositional knowledge to be more susceptible to being undermined by the presence of epistemic luck than did those without such self-reported training,<sup>17</sup> whereas, by contrast, those with self-reported philosophical training regarded knowledge-how and understanding-why to be *less* susceptible to being undermined by the presence of epistemic luck than those without self-reported philosophical training.

More specifically, with regard to knowledge-how and knowledge-that: we found that those with self-reported philosophical training, as well as self-reported training in epistemology in particular, were inclined to regard knowledge-that as more susceptible to being undermined by the presence of epistemic luck than were those without such self-reported training. Regarding understanding-why and knowledge-that: those with self-reported philosophical training were inclined to judge knowledge-that as more susceptible to being undermined by epistemic luck than those without such self-reported training, and further to judge understanding-why as comparatively more compatible with it. However, and this is a point we'll address in the discussion section, those with self-reported high *epistemological* training, specifically, took the opposite line *vis-à-vis* understanding-why.

We should note that, given that two of the authors (e.g., Carter and Pritchard 2015a, b, c) have defended *non-reductivist* accounts of both knowledge-how and understanding-why elsewhere, we were expecting that the experimental results would on the whole *not* vindicate Hypothesis 1 and Hypothesis 2<sup>18</sup>; and if Hypothesis 1 and 2 were not borne out by the experiments, then this would have been welcome news to the non-reductivist. We take the results of our experiments to be, in sum, an interesting mixture of bad news (i.e., the data from participants without self-reported expertise) and good news (i.e., the data from participants with self-reported philosophical expertise) from the perspective of the non-reductivist. The matter of just *how* good (or bad) the news was, *taken together*, for the non-reductivist about knowledge-how and understanding turns out to depend on a range of considerations to do with metaphilosophy and philosophical methodology, which we discuss in detail in §4.

Here is the plan. In §§2–3 in we report and interpret our experimental procedures and results. In §4, we offer a critical discussion which contextualizes these findings by showing how one very natural interpretation of our results fits very well with a ‘cognitive achievement’ model of knowledge-how and understanding-why. We conclude by situating the interpretive narrative advanced within contemporary discussions about the role of expertise in philosophical judgment.

<sup>17</sup> Note that those with self-reported philosophical expertise did attribute knowledge to some extent in luck cases, though to a lesser extent than those with no self-reported philosophical expertise. This is to be expected, as results from Horvath and Wiegmann (2016) suggest. Furthermore,

<sup>18</sup> Though we did expect, to some extent, that folk surveyed without philosophical training would go against the standard fake-barn intuition for knowledge-that (i.e., that no knowledge that is present in environmental luck cases), given results (e.g., Turri et al. 2015) around the time we initially were drafting the paper.



## 2 Experimental Procedures and Results

### 2.1 Procedures

We wanted to examine the (possibly differential) impact of luck on attributions of knowledge-how and knowledge-that, as well as on attributions of understanding-why and knowledge-that. To this end, we utilized a  $1 \times 2$  study design in four separate pairs of vignettes. Two of the pairs concerned knowledge-how and knowledge-that in lucky and non-lucky conditions. And two of the pairs concerned understanding-why and knowledge-that in lucky and non-lucky conditions. In all of the pairs we were interested in the potential impact of luck regarding knowledge-how and knowledge-that, or regarding understanding-why and knowledge-that.

We were also interested in measuring the judgments of both philosophers and non-philosophers. So we recruited non-philosophers through Mechanical Turk, and we recruited philosophers via on-line advertisement on various philosophy blogs. Surveys were completed on Mechanical Turk or Qualtrics. 582 participants saw one of eight vignettes. 134 participants were excluded for failing comprehension questions or for failing to complete the survey. Of the 448 remaining participants, 293 were male, and the average age was 35.3.

### 2.2 Vignettes

The vignettes given to participants sought to measure the impact of the presence of epistemic luck on ascriptions of knowledge-how, knowledge-that, and understanding-why. In particular, we were interested in:

- (i) whether the presence of epistemic luck impacts ascriptions of knowledge-that and knowledge-how equally, or not,
- (ii) whether the presence epistemic luck impacts ascriptions of knowledge-that and understanding-why equally, or not.

In order to test for this, we designed four pairs of vignettes that varied the presence of epistemic luck. In two of the pairs, participants were asked to respond to statements that the lucky/non-lucky individual possessed knowledge-how and (next) knowledge-that. Possible responses fell on a scale, with 1 representing the strongest disagreement, 4 neither agreement nor disagreement, and 7 the strongest agreement. Here is an example of one of the case-pairs we used<sup>19</sup>:

**[Knowledge-How: Luck]** Charlie needs to learn how to change a lightbulb, and so he goes to the ‘how-to’ section in his local library. He finds a shelf full of identical looking books titled *Home Repair*. In each of these books are step-by-step instructions on the way to change a lightbulb—we’ll call the way the book describes way ‘w’. Unbeknownst to Charlie, all the copies of *Home Repair* on the shelf are fakes, except for one. Pranksters have placed these copies there, and

<sup>19</sup> The first case is adapted from one originally presented by Cath (2011). See Stanley (2011b) for a response to this case.

these fake copies contain mistaken step-by-step instructions on the way to change a lightbulb. Since Charlie does not know this, he reaches up and grabs the copy of *Home Repair* nearest to him. By sheer luck, he selects the only copy in the entire library that contains genuine and reliable step-by-step instructions for changing a lightbulb, and he reads the correct step-by-step instructions on the way to change a lightbulb. Had Charlie picked up any of the other guides—which he so easily could have—he would have believed the mistaken instructions were correct.

**[Knowledge-How: Control]** Charlie needs to learn how to change a lightbulb, and so he goes to the ‘how-to’ section in his local library. He finds a shelf full of identical looking books titled *Home Repair*. In each of these books are step-by-step instructions on the way to change a lightbulb—we’ll call the way the book describes way ‘w’. Any of the copies of *Home Repair* on the shelf will give Charlie genuine and reliable step-by-step instructions. Charlie reaches up and grabs the copy of *Home Repair* nearest to him. So Charlie reads the correct step-by-step instructions on the way to change a lightbulb.

In two other pairs of cases, participants were asked respond to statements that the lucky/non-lucky individual possessed understanding-why and (next) knowledge-that. Again, Possible responses fell on a scale, with 1 representing the strongest disagreement, 4 neither agreement nor disagreement, and 7 the strongest agreement (see appendix for vignettes and questions). Here is an example of one of the case-pairs used:

**[Understanding-Why: Luck]** Kate is a scientist who seeks an explanation for why a certain chemical reaction occurred. She ordinarily uses a particular kind of instrument to conduct the relevant test, and there are several such instruments, indistinguishable from one another, on the table before her. Unbeknownst to Kate, however, all of the instruments in front of her have been tampered with, except one. If she uses any of the instruments that have been tampered with, they will tell her that it was the presence of hydrogen, rather than oxygen, that caused the reaction. Kate selects the instrument nearest to her, conducts the test, and as a result comes to believe that it was the presence of oxygen that caused the chemical reaction. As it turns out, by sheer luck, the instrument Kate selects is the *only* reliable instrument on the table, and it gives Kate the correct result. Had Kate picked up any of the other instruments—which she so easily could have—she would have believed falsely what caused the reaction.

**[Understanding-Why: Control]** Kate is a scientist who seeks an explanation for why a certain chemical reaction occurred. She ordinarily uses a particular kind of instrument to conduct the relevant test, and there are several such instruments, indistinguishable from one another, on the table before her. Further, all of the instruments on the table are reliable, such that conducting her test with any one of them will generate the same correct result. Kate selects the instrument nearest to her, conducts the test, and as a result comes to believe that it was the presence of oxygen that caused the chemical reaction. Since the instrument is reliable, it gives Kate the correct result.

We were also interested in the possibility that level of philosophical education or expertise might impact participant responses. We asked participants to rate their own



expertise in epistemology on a 1–3 scale, with 1 representing ‘low degree of expertise in epistemology,’ 2 representing ‘moderate degree of expertise,’ and 3 indicating ‘high degree of expertise.’ We also asked participants their level of philosophical education on a 1–6 scale: no education in philosophy, some undergraduate courses, undergraduate major, some graduate courses, master’s degree in Philosophy, Ph.D. in Philosophy. Finally, we gathered information on gender, age, and nationality.

### 2.3 Results

We first tested for the impact of epistemic luck on ascriptions of knowledge or understanding in all four pairs of vignettes individually.

For the first knowledge-how/knowledge-that vignette (i.e., the one involving Charlie), a  $1 \times 2$  ANOVA revealed a significant difference on ascriptions of knowledge-how ( $F(1, 114) = 7.242, p = .008$ , partial  $\eta^2 = .060$ ), but not on ascriptions of knowledge-that ( $F(1, 114) = 2.927, p = .09$ , partial  $\eta^2 = .025$ ). Interestingly, ascriptions of knowledge-how were significantly higher in the lucky condition ( $M = 5.80, SD = 1.55$  vs  $M = 4.93, SD = 1.75$ ). Ascriptions of knowledge-that were both well above the midline ( $M = 5.34, SD = 1.68$  in the lucky condition, and  $M = 5.83, SD = 1.36$  in the no luck condition).

For the second knowledge-how/knowledge-that vignette (involving Kenneth: see appendix), a one-way ANOVA revealed a significant difference on ascriptions of knowledge-how ( $F(1, 113) = 4.182, p = .043$ , partial  $\eta^2 = .036$ ), but not on ascriptions of knowledge-that ( $F(1, 113) = 1.717, p = .19$ , partial  $\eta^2 = .017$ ). As with the first knowledge-how vignette, ascriptions of knowledge-how were significantly higher in the lucky condition ( $M = 5.16, SD = 1.87$  vs  $M = 4.41, SD = 2.01$ ). Again, as with the first vignette, ascriptions of knowledge-that were both well above the midline ( $M = 5.47, SD = 1.65$  in the lucky condition, and  $M = 5.88, SD = 1.61$  in the no-luck condition).<sup>20</sup>

For the first understand-why/knowledge-that vignette (i.e., the one involving Kate), a one-way ANOVA revealed that the luck condition made no difference for ascriptions of understanding-why ( $F(1, 115) = .107, p = .744$ , partial  $\eta^2 = .001$ ) or knowledge-that ( $F(1, 115) = 1.591, p = .210$ , partial  $\eta^2 = .014$ ). Ascriptions of understanding-why were high in luck and no luck conditions ( $M = 5.66, SD = 1.48$  and  $M = 5.57, SD = 1.47$  respectively). The same was true of ascriptions of knowledge-that ( $M = 5.28, SD = 1.78$  and  $M = 5.68, SD = 1.58$  respectively).

For the second understand-why/knowledge-that vignette (involving Fiona: see appendix), a one-way ANOVA revealed that the luck condition made no difference for ascriptions of understanding-why ( $F(1, 104) = .273, p = .603$ , partial  $\eta^2 = .003$ ) or knowledge-that ( $F(1, 104) = 1.112, p = .294$ , partial  $\eta^2 = .011$ ). Ascriptions of understanding-why were high in luck and no luck conditions ( $M = 5.26, SD = 1.65$  and  $M = 5.42, SD = 1.41$  respectively). The same was true of ascriptions of knowledge-that ( $M = 5.52, SD = 1.57$  and  $M = 5.84, SD = 1.34$  respectively).<sup>21</sup>

<sup>20</sup> This may be due to a lack of statistical power. When collapsing the two knowledge-how/knowledge-that vignettes, a  $1 \times 2$  ANOVA revealed a significant difference for both knowledge how ( $F(1, 226) = 10.006, p = .002$ ) and knowledge that ( $F(1, 227) = 4.661, p = .032$ ).

<sup>21</sup> Even after collapsing the two understanding-why/knowledge-that vignettes, the lack of significance remained for understanding why ( $F(1, 217) = .004, p = .948$ ) and knowledge that ( $F(1, 217) = 3.236, p = .073$ ).

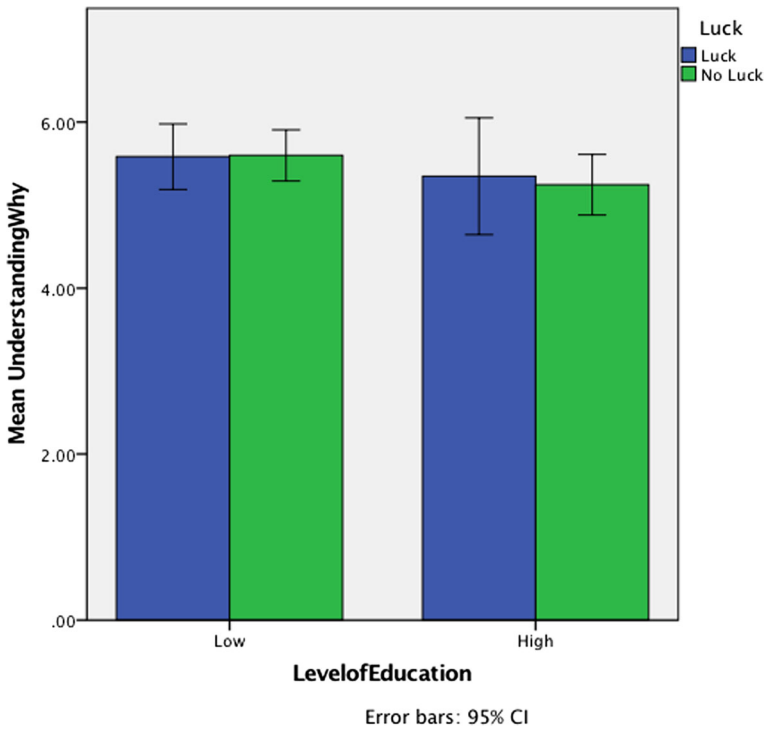


Fig. 1 Attributions of understanding why: Low vs. high training in philosophy

If we pay no attention to differences in philosophical training, then, the results are clear and surprising. Ascriptions of knowledge-that and understanding-why are not sensitive to epistemic luck. Or, at the least, the null effect reported is consistent with, and seems to suggest, a lack of sensitivity.<sup>22</sup> In contrast with the null result regarding knowledge-that and understanding-why, ascriptions of knowledge-how are sensitive to epistemic luck, but in an odd way: knowledge-how ascriptions are higher in the lucky condition.

However, we were also interested in the impact of philosophical training. In order to measure this, we performed a few different kinds of tests. First, we split participants into two groups depending on their level of training. Our 'low-training' group had taken graduate courses or less. Our 'high-training' group had received a master's degree or a Ph.D. in Philosophy. Admittedly, one might operationalize 'low' and 'high' training in different ways. We selected this way based upon the thought that completing a graduate degree in philosophy is a significant achievement, requiring a number of high-level courses. Given the wording of our question, the next level down was consistent with having taken one graduate course.

Next, we performed a  $2 \times 2$  (Luck: Luck vs. No luck  $\times$  Training: Low vs. High training) ANOVA for both knowledge-how and knowledge-that ascriptions in both pairs of vignettes (collapsed given the similar means for both pairs). We found a significant difference for Luck on ascriptions of knowledge-how ( $F(1, 228) = 9.72$ ,

<sup>22</sup> A referee notes the difficulties associated with drawing inferences from null effects. In order to justify our claim about a lack of sensitivity, it is arguable that further studies replicating our present ones would be required.

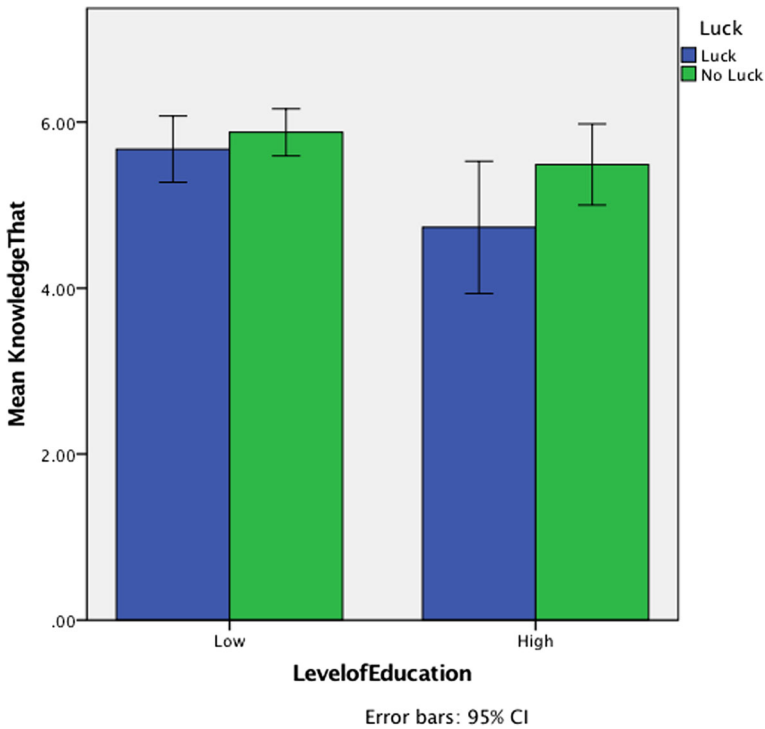
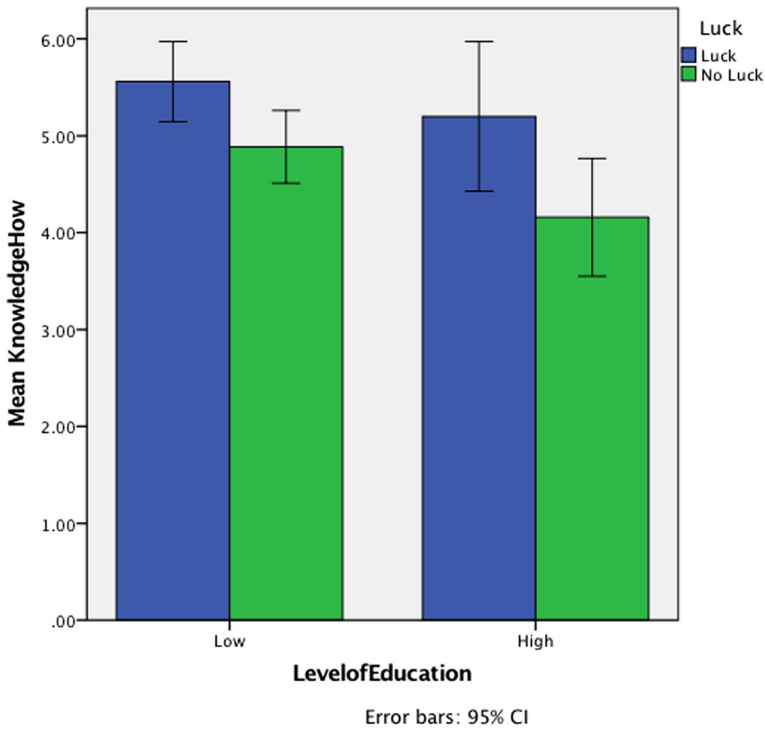


Fig. 2 Attributions of knowledge that: Low vs. high training in philosophy

$p = .002$ , partial  $\eta^2 = .042$ ) as well as knowledge-that ( $F(1, 228) = 11.262$ ,  $p = .001$ , partial  $\eta^2 = .048$ ). We also found a significant difference of Training on ascriptions of knowledge-how ( $F(1, 228) = 3.912$ ,  $p = .049$ , partial  $\eta^2 = .017$ ) as well as knowledge-that ( $F(1, 228) = 8.800$ ,  $p = .003$ , partial  $\eta^2 = .038$ ). Most importantly, while we found no interaction between Luck and Training for knowledge-how ascriptions ( $F(1, 228) = .452$ ,  $p = .502$ , partial  $\eta^2 = .002$ ), we did find a significant interaction between Luck and Training for knowledge-that ascriptions ( $F(1, 228) = 9.409$ ,  $p = .002$ , partial  $\eta^2 = .040$ ).

In the luck condition, High-training participants agreed at higher rates to the knowledge-that statement than did Low-training participants<sup>23</sup> ( $M = 4.40$ ,  $SD = 1.85$  vs.  $M = 5.78$ ,  $SD = 1.42$  respectively); both groups agreed at roughly the same level in the no luck condition ( $M = 5.85$ ,  $SD = 1.56$  vs.  $M = 5.87$ ,  $SD = 1.30$  respectively).

<sup>23</sup> Though, granted, high-training philosophers attributed knowledge-that in the luck cases to *some* extent. Though high-training philosophers attributed knowledge-that in the luck cases to a significantly *less* extent in comparison with those with no training, one potential explanation for why the willingness to attribute was not lower than it was in the high-training cases draws from recent results reported by Turri et al. (2015). Turri, Buckwalter & Blouw found that willingness to attribute knowledge is sensitive to a fine-grained distinction among lucky events. Specifically, they reported that knowledge attributions are comparatively more insensitive to luck that threatens, but ultimately does not change, the explanation for why a belief is true in contrast with lucky events which change the explanation for why a belief is true. Environmental luck cases, as such, are cases of the former variety. Possibly, then, this fine-grained feature of the luck cases accounts for some of the inclination to attribute knowledge-that by those with high-philosophical training. See §4 for discussion on this point.



**Fig. 3** Attributions of knowledge how: Low vs. high training in philosophy

Regarding knowledge-how, High-training participants agreed at slightly lower levels than did Low-training participants in the lucky condition ( $M = 5.20$ ,  $SD = 1.87$  vs.  $M = 5.56$ ,  $SD = 1.70$  respectively) as well as in the no luck condition ( $M = 4.16$ ,  $SD = 1.85$  vs.  $M = 4.89$ ,  $SD = 1.87$  respectively). As is evident, both groups of participants agreed at lower levels regarding knowledge-how in the no luck condition.

We also performed a  $2 \times 2$  (Luck: Luck vs. No luck  $\times$  Training: Low vs. High training) ANOVA for both understanding-why and knowledge-that ascriptions in both pairs of vignettes (collapsed given the similar means for both pairs). We found no significant difference for Luck on ascriptions of understanding-why ( $F(1, 219) = .037$ ,  $p = .847$ , partial  $\eta^2 < .001$ ); both groups agreed at roughly the same level ( $M = 5.51$ ,  $SD = 1.55$  in the Luck condition,  $M = 5.49$ ,  $SD = 1.44$  in No Luck). But we did find a significant difference for Luck on ascriptions of knowledge-that ( $F(1, 219) = 4.327$ ,  $p = .039$ , partial  $\eta^2 = .020$ ). We found no significant difference of Training on ascriptions of understanding-why ( $F(1, 219) = 1.741$ ,  $p = .188$ , partial  $\eta^2 = .008$ ); High Training participants agreed at the same level in Luck and No Luck conditions ( $M = 5.35$  vs.  $M = 5.24$  respectively), as did Low Training participants ( $M = 5.58$  vs.  $M = 5.60$  respectively). But we did find a significant difference of Training on ascriptions of knowledge-that ( $F(1, 219) = 8.300$ ,  $p = .004$ , partial  $\eta^2 = .037$ ). In this case, there was no significant interaction for ascriptions of understanding-why ( $F(1, 219) = .070$ ,  $p = .791$ , partial  $\eta^2 < .001$ ) or knowledge-that ( $F(1, 219) = 1.436$ ,  $p = .232$ , partial  $\eta^2 = .007$ ). Overall, High-training participants agreed at lower levels regarding knowledge-that in both conditions (in the luck condition,  $M = 4.73$ ,  $SD = 1.97$  for High-

training, and  $M = 5.67$ ,  $SD = 1.48$  for Low-training; in the no luck condition,  $M = 5.49$ ,  $SD = 1.55$  for High-training, and  $M = 5.88$ ,  $SD = 1.41$  for Low-training).

Next, we sought to examine the impact of self-reported expertise in epistemology on participant responses. We performed  $2 \times 3$  ANOVA (Luck: Luck vs. No luck  $\times$  Epistemology: Low vs. Moderate vs. High) for both knowledge-how and knowledge-that ascriptions in both pairs of vignettes (collapsed given the similar means for both pairs). We found a main effect for Luck on both knowledge-how ascriptions ( $F(2, 228) = 4.178$ ,  $p = .042$ , partial  $\eta^2 = .019$ ) and knowledge-that ascriptions ( $F(2, 228) = 14.152$ ,  $p < .001$ , partial  $\eta^2 = .060$ ). We found no effect for Epistemology on knowledge-how ascriptions ( $F(2, 228) = 2.903$ ,  $p = .057$ , partial  $\eta^2 = .026$ ) or knowledge-that ascriptions ( $F(2, 228) = .298$ ,  $p = .743$ , partial  $\eta^2 = .003$ ). There was a significant interaction for knowledge-that ascriptions ( $F(2, 228) = 5.641$ ,  $p = .004$ , partial  $\eta^2 = .049$ ), and none for knowledge-how ascriptions ( $F(2, 228) = .109$ ,  $p = .897$ , partial  $\eta^2 = .001$ ).

Regarding knowledge-how ascriptions: there was a general trend towards agreeing at lower levels regarding knowledge-how in the non-lucky condition. The means for low expertise participants ( $N = 155$ ) were 5.65 ( $SD = 1.65$ ) in the lucky condition, and 4.82 ( $SD = 1.93$ ) in the non-lucky condition. The means for moderate expertise participants ( $N = 48$ ) were 4.85 ( $SD = 2.06$ ) in the lucky condition, and 4.14 ( $SD = 1.78$ ) in the non-lucky condition. The means for high expertise participants ( $N = 24$ ) were 5.33 ( $SD = 1.58$ ) in the lucky condition, and 4.87 ( $SD = 1.73$ ) in the non-lucky condition.

Regarding knowledge-that ascriptions: Low expertise participants ( $N = 155$ ) agreed at the same level regarding knowledge in luck and no luck conditions ( $M = 5.68$ ,  $SD =$

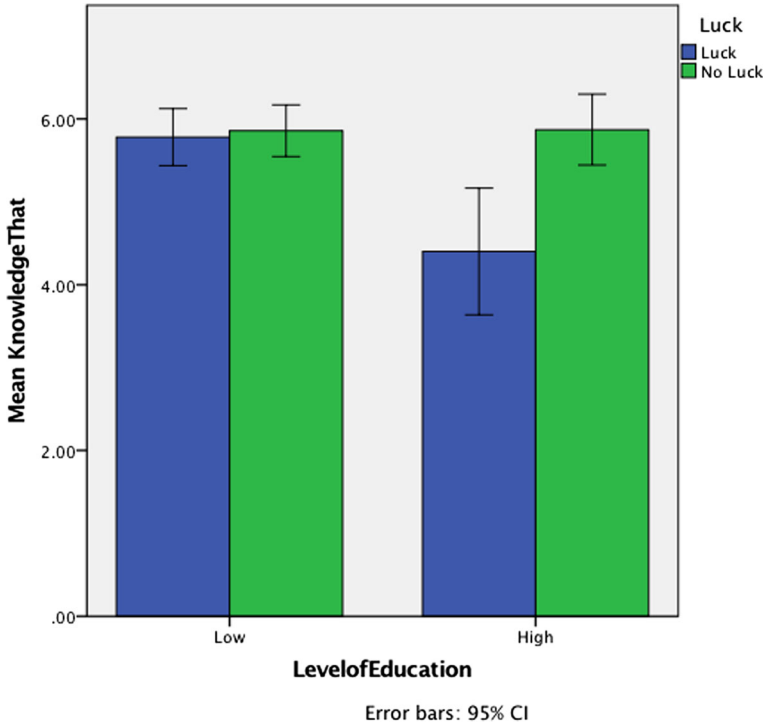


Fig. 4 Attributions of knowledge that: Low vs. high training in philosophy

1.53 vs.  $M = 5.67$ ,  $SD = 1.62$ ); Moderate expertise participants ( $N = 48$ ) agreed at higher levels regarding knowledge in the no luck condition ( $M = 6.11$ ,  $SD = 1.23$  vs.  $M = 4.90$ ,  $SD = 1.65$ ); High expertise participants ( $N = 24$ ) agreed at a higher level in the no luck condition ( $M = 6.47$ ,  $SD = .64$  vs.  $M = 4.56$ ,  $SD = 2.19$ ).

We then performed a  $2 \times 3$  (Luck: Luck vs. No luck  $\times$  Epistemology: Low vs. Moderate vs. High) ANOVA for both understanding-why and knowledge-that ascriptions in both pairs of vignettes (collapsed given the similar means for both pairs). We found no main effect for Luck on understanding-why ascriptions ( $F(2, 218) = .302$ ,  $p = .583$ , partial  $\eta^2 = .001$ ), and a significant main effect for Luck on knowledge-that ascriptions ( $F(2, 218) = 6.019$ ,  $p = .015$ , partial  $\eta^2 = .028$ ). We found significant main effects for Epistemology on understanding-why ascriptions ( $F(2, 218) = 4.225$ ,  $p = .016$ , partial  $\eta^2 = .038$ ) as well as knowledge-that ascriptions ( $F(2, 218) = 10.009$ ,  $p < .001$ , partial  $\eta^2 = .086$ ). We also found a significant interaction for both understanding-why ascriptions ( $F(2, 218) = 5.403$ ,  $p = .005$ , partial  $\eta^2 = .049$ ), and knowledge-that ascriptions ( $F(2, 218) = 4.285$ ,  $p = .015$ , partial  $\eta^2 = .039$ ).

Regarding understanding-why ascriptions: Low expertise participants ( $N = 133$ ) agreed at the same level regarding understanding in luck and no luck conditions ( $M = 5.67$ ,  $SD = 1.44$  vs.  $M = 5.80$ ,  $SD = 1.35$ ); Moderate expertise participants ( $N = 61$ ) agreed at a lower level in the no luck condition ( $M = 4.65$ ,  $SD = 1.49$  vs.  $M = 5.58$ ,  $SD = 1.44$ ); High expertise participants ( $N = 24$ ) agreed at a higher level in the no luck condition ( $M = 5.85$ ,  $SD = .90$  vs.  $M = 4.64$ ,  $SD = 2.01$ ).

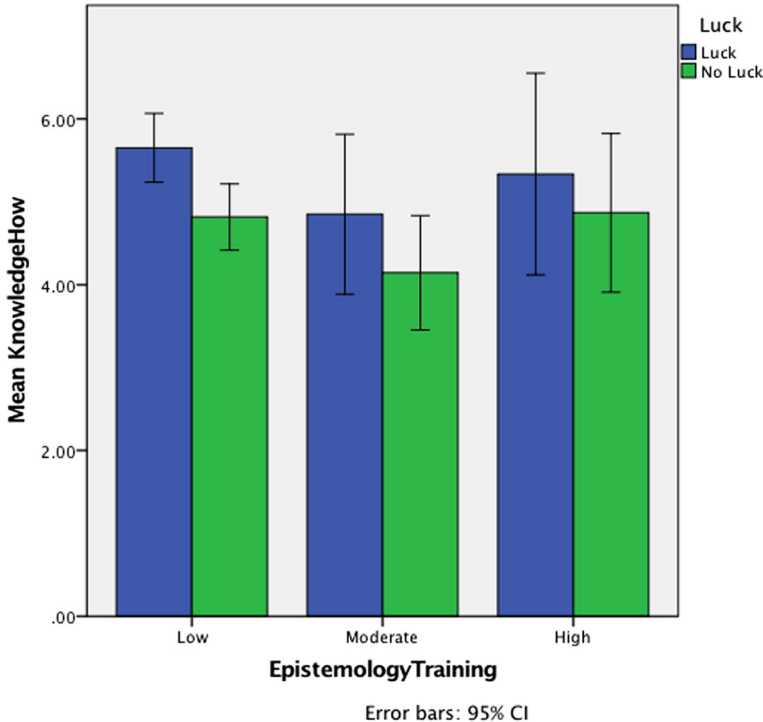


Fig. 5 Attributions of knowledge how by self-reported level of expertise in epistemology



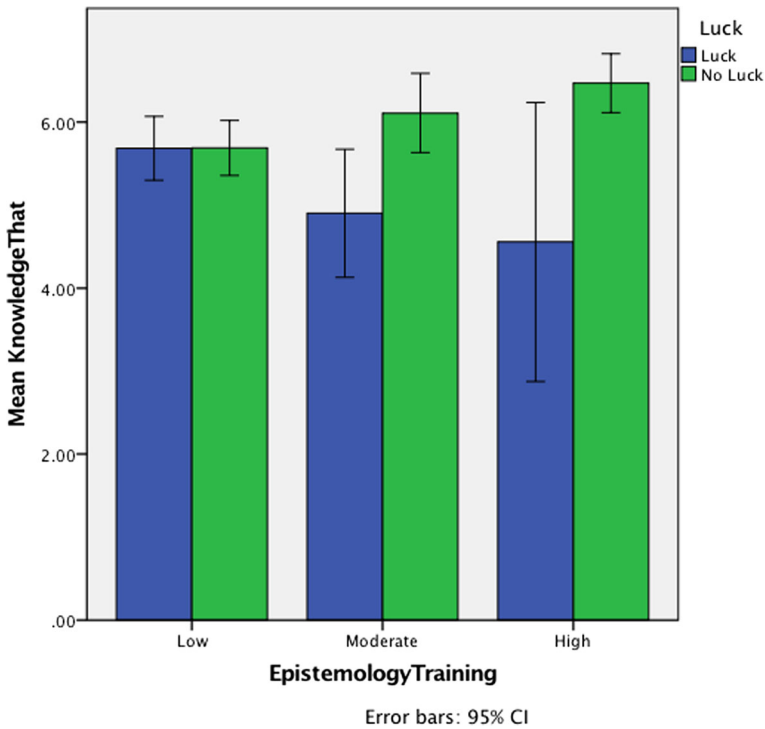


Fig. 6 Attributions of knowledge that by self-reported level of expertise in epistemology

Regarding knowledge-that ascriptions: Low expertise participants ( $N = 133$ ) agreed at roughly the same level regarding knowledge in luck and no luck conditions ( $M = 5.74, SD = 1.48$  vs.  $M = 6.03, SD = 1.25$ ); Moderate expertise participants ( $N = 61$ ) agreed at roughly the same level regarding knowledge in luck and no luck conditions ( $M = 5.50, SD = 1.53$  vs.  $M = 5.24, SD = 1.62$ ); High expertise participants ( $N = 24$ ) agreed at a higher level regarding knowledge in the no luck condition ( $M = 5.38, SD = 1.89$  vs.  $M = 3.55, SD = 1.86$ ) (Figs. 1, 2, 3, 4, 5, 6, 7 and 8).

### 3 Outliers

As we noted in highlight form in §1, our results support an interesting overarching narrative regarding the two hypotheses, Hypothesis 1 and Hypothesis 2. Recall that these hypotheses stated:

**Hypothesis 1:** Knowledge-how and knowledge-that are equally susceptible to being undermined by epistemic luck. (Predicted by reductive accounts of knowledge-how).<sup>24</sup>

<sup>24</sup> By ‘susceptible’ we mean that agreement levels are predicted to move in a certain direction (downward in cases of luck). By ‘undermined’ we mean that willingness to attribute (e.g., in the case of Hypothesis 1) knowledge-how or knowledge-that will be reduced to a statistically significant degree, not that yes/no judgments will flip. Since we are operationalising ‘susceptible’ and ‘undermined’ in these ways we are looking for significant differences in patterns of willingness to attribute knowledge-how and knowledge-that.

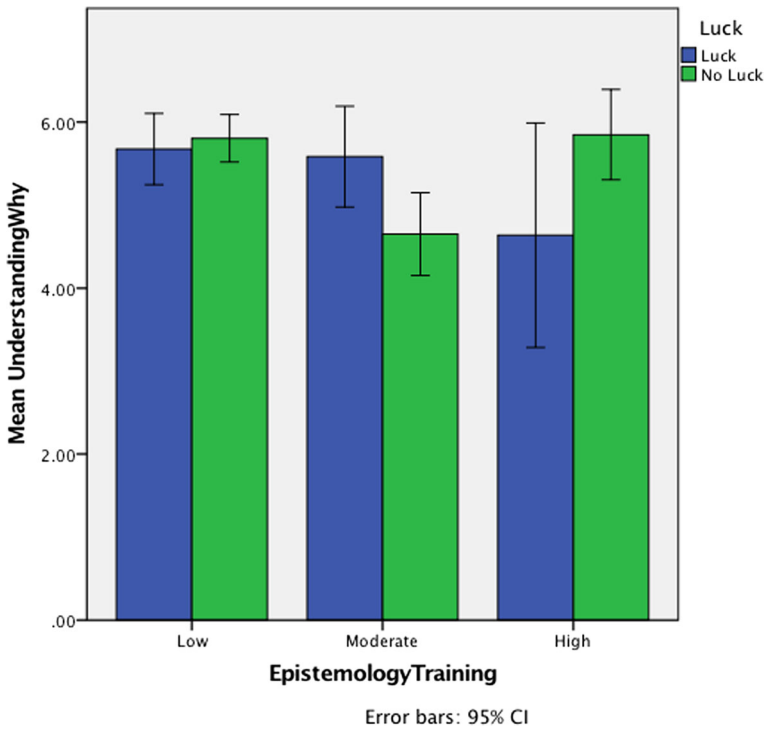


Fig. 7 Attributions of understanding why by self-reported level of expertise in epistemology

**Hypothesis 2:** Understanding-why and knowledge-that are equally susceptible to being undermined by epistemic luck. (Predicted by reductionist accounts of understanding-why).

The nub of the matter is that those without self-reported philosophical training are much more inclined to attribute knowledge-that, knowledge-how and understanding-why in patterns that are consistent with Hypothesis 1 and Hypothesis 2 (predicted by the two reductionist proposals), than are those with self-reported philosophical training. That said, we submit that there is a further, positive element of this narrative. This positive angle is that those with self-reported philosophical training not only attributed these standings in a way that runs contrary to what the reductionist proposals predict, but also the pattern of attributions by those with self-reported philosophical training aligns very well (and much better than does the pattern of attributions by those without self-reported philosophical training) with a certain principled way of thinking about *cognitive achievement*, which is (in short) cognitive success that is primarily because of cognitive ability.

Before we get to this point about cognitive achievement, however, we will first explore two kinds of ‘outlier’ results that seem to run contrary to this narrative, and what might account for them. As we have noted, those with no self-reported philosophical training don’t really think that the presence of epistemic luck (in comparison with control cases with no luck present) undermines knowledge-how, understanding-why or even knowledge-that. However, in the case of knowledge-how specifically, both

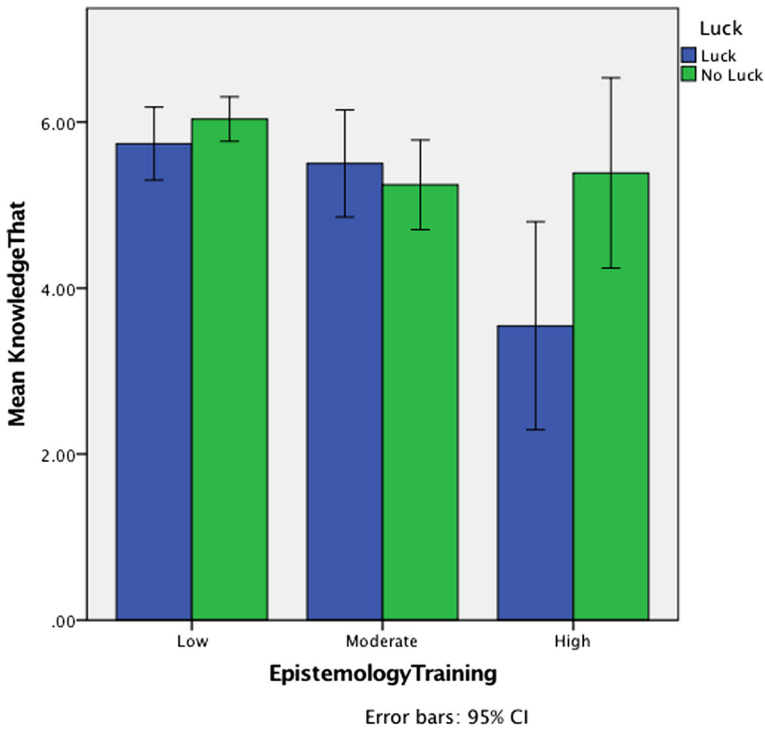


Fig. 8 Attributions of knowledge that by self-reported level of expertise in epistemology

those with no philosophical training as well as with self-reported philosophical training actually moved in what is (from an epistemological standpoint) an almost inexplicable direction: they were *more likely* to attribute knowledge-how in cases where epistemic luck is *present* than in the control cases where no luck was present. This is obviously very surprising. We have two remarks to make on this point, one specific, the other more general.

The first remark is that, at least, from an epistemological perspective, it’s hard to make sense of how the presence of luck could generate any kind of epistemic gain of any sort. However, there might be a *non-epistemic* story to tell. For example, Martha Nussbaum’s (1986) treatise on moral luck maintains that certain kinds of moral value are importantly tied to human vulnerability. One way to think of this point is in terms of the goodness of a life narrative: a life narrative that includes fortune in the face of vulnerability is perhaps (in terms of moral value) to be desired to one without it.<sup>25</sup> At

<sup>25</sup> Contrast two versions of a case where a person requires medical attention for an infection, in the form of antidote X. In the first variation of the case the individual is in a city, where hospitals with antidote X are abundant, and the individual is easily cured. In the second variation of the case, the individual is much more vulnerable: she is in a remote area with no hospitals. The remote area happens to be the only area where the plant supplying antidote X grows wildly. The individual is accordingly cured. There is something more striking about the second version of the case, which might incline one to think there is a kind of goodness or value present that is not present in the first case. A related kind of point about the value of success in the face of vulnerability is also found in Milton’s *Paradise Lost*, Book III, in his discussion of the value of one’s freedom to fall.

any rate, if the thought that success in the face of vulnerability brings about a special kind of value, the precedent for thinking so is likely moral rather than epistemic.

A second more general point is this. After reading our vignettes, participants were asked about both knowledge-how and knowledge-that. It is possible that being asked about both generated an inclination to offer *contrastive* ratings. One way this might have gone is as follows: In the non-lucky condition, participant attention may have been focused upon the propositional nature of the information delivered—upon the fact that knowledge-how was transmitted via written instructions—rendering an ascription of knowledge-that (i.e., propositional knowledge) seemingly more apt by comparison than an ascription of knowledge-how. In response, participants may have rated knowledge-how lower simply as a way to contrast knowledge-how with knowledge-that. This might explain the fact that ascriptions of knowledge-how are lower in degree, even though they are far enough above the mid-point to qualify as ascriptions of knowledge-how overall. By contrast, in the lucky condition, the presence of luck may have impacted ratings of knowledge-that significantly enough to erase this contrastive effect (indeed, high-training participants showed an effect in the opposite direction, rating knowledge-that lower than knowledge-how ( $M = 4.4$  vs.  $5.2$ , respectively). If this proposal is correct, further studies asking about only knowledge-how or knowledge-that, as opposed to both, should erase this odd result.

The second kind of ‘outlier’ case with respect to the more general trend of results we found concerned a subset of those with self-reported philosophical training—specifically, those with self-reported high degrees of epistemological training—who regarded not only knowledge-that to be incompatible with epistemic luck but also took understanding-why to be incompatible with epistemic luck. We think there is potentially a natural explanation for this. This involves noting a disparity between what has been the received view within epistemology, specifically. Consider that ‘anti-reductivism’ (in the form of anti-intellectualism) has been the received thinking about knowledge-how within epistemology since Ryle (1945, 1949). In contrast, it’s only been relatively recently that the position that knowledge-how is a kind of knowledge-that has been submitted as a serious position in epistemology. This is not the case for understanding-why. As Stephen Grimm (2014, 329) has remarked, the view that understanding is just knowledge of causes is in fact ‘the traditional view of understanding’—one with ‘longstanding appeal.’<sup>26</sup> It would thus not be surprising that individuals with not just philosophical training, but specifically epistemological training, might be more inclined to

<sup>26</sup> The longstanding appear of this position has been prevalent especially in epistemology and the philosophy of science. Note, however, that we are using ‘reductivism’ in a narrow sense here, to capture views of understanding-why according to which some class of propositional knowledge (e.g., knowledge of causes) suffices for understanding-why. We highlight this because there are more robust philosophical positions which go under the description of ‘reductivism’ which we do not intend to capture with our use of the term. See, for example, Ney (2008) for an overview of various forms of reductivism.

judge in accordance with the inherited view, due to exposure. This might potentially explain why the fine-grained class of individuals with self-reported philosophical training who reported high degrees of epistemological training would be more inclined to think of understanding-why as (like knowledge-that) incompatible with epistemic luck, even though this intuition wasn't present with regard to knowledge-how.<sup>27</sup>

#### 4 Cognitive Achievement

We want to shift focus now to an interesting aspect of the results from individuals with self-reported philosophical training. Regarding this shift, one caveat deserves mention. The analyses we performed were exploratory, and conducted in response to surprising pilot studies that indicated non-philosophers attributed knowledge and understanding in the presence of luck. Before running the studies with expert participants we had a weak expectation that we would find differences between philosophical and epistemological 'experts' and 'novices.' But we needed to run the studies and analyses to make sure. As a referee notes, such exploration is epistemically permissible and necessary, but given the fuzziness of our priors before conducting the analyses, replication would bolster confidence in the conclusions we wish to draw. However, given difficulties associated with accumulating high numbers of those with high philosophical training, it outstrips our capacities to replicate these results with higher numbers of participants (but see Horvath and Wiegmann 2016). We leave it, then, to future work to perform the necessary replications regarding the differences we have reported.

As we noted, individuals with self-reported high philosophical training think to a greater extent than those without self-reported training that (i) propositional knowledge is incompatible with epistemic luck, whereas by contrast (ii) knowledge-how and understanding-why are held to be compatible with it. As we noted, this pattern of attributing these epistemic states runs contrary to Hypotheses 1 and 2 as predicted by reductive intellectualism and traditional reductivism about understanding-why, respectively.

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<sup>27</sup> A further feature of our data deserves mention here. We discovered that at a general level, those without philosophical training are fairly insensitive to the impact of luck on attributions of knowledge-that, knowledge-how, and understanding-why. This result is anticipated by and extends previous research into folk attributions of knowledge in so-called Gettier cases (Starmans and Friedman 2012) and barn façade cases (Colaço et al. 2014). What has not been anticipated in previous work is the attribution patterns of philosophers. While those with self-reported philosophical training were significantly more sensitive to luck than those without such training, in the main self-reported philosophers still attributed knowledge in the lucky cases. For our high-training participants: on a 1–6 scale, with 4 representing slight agreement, 5 agreement, and 6 strong agreement, means for knowledge attribution in the lucky cases were all above 4.4. Even amongst those with self-reported expertise in epistemology—admittedly, a small group of participants—knowledge-that attributions in the lucky cases were 4.56 in knowledge-how vignettes, and 3.55 in understanding why vignettes. Given the small sample size, it seems further investigation of philosophers' knowledge attribution in the presence of luck is warranted.

Interestingly, however, this pattern of attributions fits very well overall (albeit not perfectly)<sup>28</sup> with a certain strand in the contemporary literature, regarding the nature of cognitive achievement.<sup>29</sup> Cognitive achievements are held to be cognitive successes—true belief, typically—which are primarily attributable to one’s exercise of relevant cognitive agency. So, for example, it is not enough for a cognitive achievement that one gets it right (i.e., one is cognitively successful), since this could be attained by pure happenstance (a lucky guess, say). In particular, one’s cognitive success needs to be the product of one’s cognitive ability, as when one uses one’s observational skills to form a belief about one’s environment. But even cognitive success that is the product of (relevant) cognitive ability is not sufficient for cognitive achievement, as one’s cognitive success can always be Gettierised. Perhaps, for example, one skillfully forms an observational belief about one’s environment, but that this belief is only true due to happenstance (as in the famous case of the farmer who skillfully, and truly, judges that there is a sheep in the field, albeit by looking at a big hairy dog which is obscuring from view the sheep behind). In this case one’s cognitive success, while in a purely causal sense a product of one’s cognitive ability, is not attributable to one’s cognitive ability, but rather simply down to luck. Cognitive achievement thus demands a certain kind of explanatory relationship between one’s cognitive success and one’s cognitive agency, whereby the former is primarily attributable to the latter (as opposed to other factors, such as dumb luck).

A further distinction that we can draw here is between *strong* and *weak* cognitive achievements. Whereas the latter only requires a cognitive success that is primarily attributable to one’s exercise of relevant cognitive ability, the former requires more. In particular, it demands that one’s cognitive success either involves the manifestation of a high level of cognitive ability, or else that it involves the overcoming of a significant epistemic obstacle to success. The

<sup>28</sup> See the outlying points noted in §3. Also, as we note later in this section—and in line with Horvath and Wiegmann (2016) results, even those with philosophical training attributed knowledge-that in the luck cases to *some* extent (albeit, to an interestingly lesser extent than did those without self-reported philosophical training). We comment on this point in more detail later in this section.

<sup>29</sup> Note that our suggestion here is not that our empirical results establish in a compelling way the truth of the kind of cognitive achievement model articulated in this section (or for that matter that the empirical results constitute a strong argument for embracing this view over alternatives). Less ambitiously, we are registering just that there is a philosophically principled way of thinking about the relationship between knowledge-that, knowledge-how and understanding-why, one with an already established literature, which stands to account for the pattern of attributions made by those with self-reported philosophical expertise: namely, that knowledge-how and understanding-why are more resilient to being undermined by the presence of epistemic luck than is knowledge-that because the former but not the latter involve cognitive achievement. We intend to leave it open whether the epistemic weight in favour of the cognitive achievement model outlined, in light of the reported attributions by participants with self-reported philosophical expertise, should be regarded as especially significant. This question turns on more fundamental questions about the philosophical significance of experimental results, engagement with which is beyond our present objective, which is simply to register that there is in fact a principled proposal with which the noted results fit very well.



point of the distinction is to highlight that weak cognitive achievements are sometimes very easily attained. Indeed, in normal circumstances, one can exhibit a weak cognitive achievement just by opening one's eyes and observing one's surroundings. Strong cognitive achievements, in contrast, are less common. For example, in virtue of his superior cognitive skills, Sherlock Holmes may observe something in one's environment that one would never spot by oneself. Or consider the person who works out the mathematical puzzle herself, rather than simply looking up the answer at the back of the book. In doing so she has overcome an epistemic obstacle to success and thereby exhibiting a strong, rather than just a weak, cognitive achievement.<sup>30</sup>

The relevance of cognitive achievements for our purposes becomes apparent once one reflects that while cognitive achievements are incompatible with standard Gettier-style epistemic luck (which undermines knowledge-that), they are compatible with another kind of epistemic luck, a species of epistemic luck which is incompatible with knowledge-that. Standard Gettier-style epistemic luck is *intervening epistemic luck*, in that it involves an external factor intervening between the success and the subject's cognitive agency such that the former is not primarily attributable to the latter.<sup>31</sup> So, for example, in the famous case offered above of the farmer's belief about there being a sheep in the field, he isn't actually looking at a sheep at all, but only a sheep-shaped object. Nonetheless, despite this disconnect between what he thinks he is looking at and what he is in fact looking at, his belief happens to be true regardless.

Not all epistemic luck which undermines knowledge-that is of this intervening sort, however. Consider *environmental epistemic luck*, which is the particular variety of epistemic luck which featured in each of our 'luck' vignettes. This is where nothing intervenes between the subject's cognitive success and her exercise of cognitive agency, but where nonetheless the belief so formed is only luckily true on account of some feature in the subject's environment. Suppose, for example, that our farmer really is looking at a genuine sheep rather than a big hairy dog, but that it is in the nature of his environment that he could so very easily have been looking at a big hairy dog instead and would have been none the wiser. So construed, although there is no intervening epistemic luck in play, it is nonetheless the case that his true belief could very easily have been false, just as in the standard Gettier-style case involving intervening epistemic luck. That's why the prevailing orthodoxy in mainstream epistemology has been to judge that knowledge-that is lacking in such cases. Crucially, however, cognitive achievements seem to be compatible with environmental epistemic luck. After all, although our farmer could so very easily have been mistaken, given the actual circumstances he is in his cognitive

<sup>30</sup> These points about cognitive achievements, both strong and weak, are usually held to apply, *mutatis mutandis*, to achievements more generally. For a general discussion of achievements, see Pritchard (2010).

<sup>31</sup> Compare with the kind of luck cases, tested in Turri (2013), according to which the luck in play made a difference to the explanation for why the belief was correct.

success does seem to be primarily attributable to his exercise of cognitive agency. Remember that he really is seeing a genuine sheep before him, and his true belief is attributable to precisely this exercise of his cognitive agency.<sup>32</sup>

Cognitive achievements thus come apart from knowledge-that, albeit in subtle ways.<sup>33</sup> Moreover, it has been argued in the literature that knowledge-how and understanding-why are similarly compatible with environmental epistemic luck.<sup>34</sup> Indeed, it has been proposed that the reason for this is that these epistemic standings are both kinds of cognitive achievement, unlike knowledge-that.<sup>35</sup> If this point is correct, then one initially tempting conclusion to draw is that the model of cognitive achievements articulated in the foregoing (in some sense to be clarified) gains pro tanto support from our experimental results in the following very specific respect: that those with self-reported philosophical training were considerably more inclined than those without such training to attribute knowledge-how, understanding-why and knowledge-that in patterns that are consistent with this model of cognitive achievements.

This (tentative) explanation suggests a direction for future research. One key question that has emerged concerns the susceptibility of expert and novice philosophical judgments to the model of cognitive achievements sketched above. Future studies could operationalize this model via a series of cases, and test the judgments of novices and experts regarding knowledge-that on the one hand, and cognitive achievements of different sorts on the other hand. Results in line with those we report here would serve as a conceptual replication in favor of our explanation. But in any case results from such studies would serve as an interesting extension of experimental work that seeks to understand the sensitivity of attributions of epistemically interesting concepts to types of luck.

<sup>32</sup> For a more developed defence of the idea that cognitive achievement, unlike knowledge-that, is compatible with environmental epistemic luck, see the epistemic twin earth argument offered by Kallestrup and Pritchard (2014). For more on the distinction between environmental and intervening epistemic luck, see Pritchard (2009, 2012a, 2015) and Pritchard, Millar and Haddock (2010, chs. 1–4). See, however, Pavese (*forthcoming*) for a recent criticism of the idea that environmental luck cases suffice to show that know-how, specifically, comes apart from knowledge-that. Pavese's suggestion, drawing on work from Marley-Payne (2016), is that the following kind of conjunction sounds problematic:

"Thanks to the instructions in the manual, now Charlie knows how to fix the light bulb, although he does not know that he can fix it by following the instructions in the manual." (*forthcoming*, 13)

However, if know-how, *qua* cognitive achievement, is compatible with environmental epistemic luck in a way that knowledge-that (of the sort the intellectualist would identify with know-how) is *not*, then such conjunctions should *not* be problematic. Thus, as Pavese's line of argument goes, environmental luck cases do not suffice to show that whatever kind of cognitive achievement is exhibited by know-how comes apart from the corresponding item of knowledge-that. While Pavese's point is an interesting one, we anticipate that the counterintuitiveness of the conjunction might owe in part to the conjunction's qualifier, which is 'thanks to the instructions in the manual.' We submit that there are other ways of expressing the core idea captured by the conjunction that are comparatively more felicitous. For example, 'Sure, Charlie knows how to unscrew the lightbulb, but given that the book he consulted was luckily grabbed from a shelf of fakes, he doesn't know *that* the directions he used are true, even if he's justified in believing them.'

<sup>33</sup> Knowledge-that comes apart from cognitive achievement in the other direction too (i.e., in the sense that there are instances of the former which aren't also instances of the latter), though this doesn't concern us here. For more on this point, see Pritchard (2009, 2012a), Pritchard et al. (Pritchard et al. 2010, chs. 1–4), and Kallestrup and Pritchard (2012).

<sup>34</sup> See, for example, Carter and Pritchard (2015b).

<sup>35</sup> For this point as applied to knowledge-that and understanding-why, see Pritchard (2009, 2014a) and Pritchard et al. (Pritchard et al. 2010, ch. 4). For this point as applied to knowledge-that and knowledge-how, see Carter and Pritchard (2015a, 2015b, 2015c).

Here, though, it is important to be careful. Consider that any thoroughgoing validation story ought to be prepared to indicate why it would be ‘better news’ for a given view that those with self-reported philosophical training attribute epistemic states in a way that is compatible with the view than do those without such training. And on this point some delicacy is needed because there are in fact two very different ways such a claim might be put forward. One strong way of advancing this further claim, we suggest, runs in to the well known ‘calibration problem’ for philosophical expertise, while a weaker way of advancing the further claim plausibly avoids it.<sup>36</sup>

The strong and comparatively less defensible interpretation of the claim in question is that, generally speaking, intuitions informed by philosophical training are more *truth-conducive* than are non-philosophical intuitions (e.g., Williamson 2007, 2011). This appeal to philosophical expertise, as part of a general claim about intuitions, is notoriously problematic to defend.<sup>37</sup> Part of the difficulty here is that whereas other epistemic sources, such as perceptual observation, can be calibrated for their reliability by comparing their results against results gained from other sources, this kind of calibration doesn’t seem to be available in the case of philosophical intuition, since this seems only to be testable by appeal to other philosophical intuitions.<sup>38</sup>

However, there is plausibly a weaker but also interesting version of this kind of claim available, and one which needn’t take for granted any contestable general thesis about the truth-conduciveness of philosophical versus lay judgments. The weaker version of the claim takes as a starting point the observation that the explanation (on the cognitive achievement model articulated above) for why knowledge-how and understanding-why are compatible with a kind of epistemic luck that’s incompatible with knowledge-that is a philosophically *nuanced* one, one the detection of which would plausibly be more likely for those with practice and training in philosophy than for those without it. If this claim about nuance and detection is on the right track, then given that, as Williamson (2007, 191) puts it, ‘philosophy students have to learn how to apply general concepts to specific examples with careful attention to the relevant subtleties ...’, we’d have reason to expect that a potential explanation for why (in short) lay versus trained judgments came apart is that the nuances were detected to a greater extent by the judgments of those with training as opposed to those without training.

<sup>36</sup> See, however, Weinberg et al. (2012), which explores ways of calibrating intuitions that don’t involve appealing to other philosophical intuitions.

<sup>37</sup> For one such criticism, see Weinberg et al. (2010). Cf., Tobia et al. (2013), for a related point in the area of specifically moral intuitions and Machery and Stich (2012) in the case of linguistic intuitions. One line of argument to the effect that philosophical intuitions are (in at least one respect) inferior to lay intuitions concerns contamination; philosophers’ judgments are already likely to be theory-laden. The significance of this point raises deep questions about experimental methodology. Williamson’s expertise-driven counter-reply to this kind of contamination point is one he makes in *The Philosophy of Philosophy* and revisits in his (Williamson 2011) reply to Weinberg et al. (2010). He writes:

“Although the philosophically innocent may be free of various forms of theoretical bias, just as the scientifically innocent are, that is not enough to confer special authority on innocent judgment, given its characteristic sloppiness.” (Williamson 2007, 191)

This is a rebutting reply. Perhaps though there are also undercutting replies available. For our purposes, however, to reiterate, we aren’t taking a stand on the comparative *truth-conduciveness* of trained versus lay judgments but (as we note later in §4).

<sup>38</sup> For some key discussions of this problem, see Cummins (1998), Weatherson (2003), and Nagel (2007). See Pritchard (2012b, 2014b) for further discussion of the metaepistemological issues which are relevant here.

One initial counter to the weaker interpretation is that those with philosophical (or, at least, epistemological) training might not actually be detecting nuance at all but rather reflecting what is perhaps a dogmatic tendency in undergraduate epistemology classes to teach that know-how is ‘ability knowledge’. Perhaps, as this line of thinking might go, if know-how were not so quickly set aside as something other than propositional knowledge in the course of epistemology undergraduate education, those with such training might be more inclined to view these cases without prejudice.<sup>39</sup> While this is an interesting point, we submit that it would be problematic to conclude that, even if this prejudice were a pervasive one, it would better explain the patterns of judgments by those with self-reported training than detection of nuance, given that (i) any such prejudice would not directly involve assessments of know-how and luck (given that the claim that know-how is ability knowledge is not a claim about luck); and (ii) given that the capacity to detect the relevant nuances (i.e., the kinds of capacities acquired through thinking carefully about Gettier cases in epistemology classes) bears directly on how such individuals would assess the relevant cases. Furthermore, the judgments reported by those with training indicate parallel inclinations in the case of understanding, where such a prejudice would not similarly apply.

A second challenge to this weaker interpretation is that we’d need some evidence that the cases are in fact nuanced enough that their subtleties would be picked up to a greater extent by those with philosophical training than otherwise. Interestingly, there already is some, albeit indirect, evidence to this effect. In a 2013 study, John Turri (2013) reported experimental results which indicated that ‘laypeople who answer that the Gettier subject knows aren’t competently enough assessing the case.’<sup>40</sup> To the extent that this is right, we have some cause to doubt that those without philosophical training would be as sensitive by comparison as those with such training at picking up nuances at least as sophisticated as the Gettier intuition.

We say ‘at least’ because, as Turri et al. (2015) have reported in a recent paper, participants’ willingness to attribute knowledge is plausibly also sensitive to a fine-grained distinction among lucky event types; in particular, Turri et al. (2015) found that knowledge attributions are comparatively more insensitive to luck that threatens, but ultimately does not *change* (as in the specifically environmental luck which featured in our luck cases does not), the explanation for why a belief is true in contrast with lucky events which *do* change the explanation for why a belief is true. Psychological or other explanations<sup>41</sup> for why this is so pose, as they note, an ‘important question for further research’ (2015, 388) and we agree, particularly because (at least with reference to the epistemological notion of safety (e.g., Pritchard 2005)) the relative *unsafety* of a target belief can be fixed across cases pairs that differ with respect to the role luck plays in

<sup>39</sup> Thanks to an anonymous referee at *The Review of Philosophy and Psychology* for raising this point. There is some merit to the concern that epistemology students will be naturally led to view know-how as a kind of ability. If knowledge-how were a kind of knowledge-that, one might expect knowledge-how to feature more prominently in introductory texts. In certain prominent texts, knowledge-how is disregarded completely. For example, in Sosa et al. (2008) (60 Chapters) and Greco and Sosa (1999) (17 chapters), knowledge-how is neither a topic of a chapter, nor does it feature in either index. See Carter and Navarro (2018), ‘The Analysis of Knowledge-How: An Anti-Intellectualist Manifesto’, unpublished manuscript) for further discussion.

<sup>40</sup> Turri’s (2013) argument adverts to a claim he’s established to the effect that conspicuous tripartite structure guides laypeople to competently assess Gettier cases.

<sup>41</sup> For an overview of some of the various factors which have been noted as influencing judgment in philosophical thought experiments, see Horvath and Wiegmann (2016, §1).

explaining why an individual's belief is true.<sup>42</sup> At any rate, given that our luck cases were uniformly environmental and as such cases where the luckiness did *not* change the explanation for why the target belief is true, we have some additional reason to doubt that those without philosophical training would be as competent by comparison as those with such training at assessing the case pairs in light of the presence of luck.

As we've reported, patterns of judgment according to which knowledge-how and understanding-why are compatible with a kind of epistemic luck that's incompatible with knowledge-that align to a greater extent with those with self-reported philosophical than with those without it. This—as well as the overarching cognitive achievement line outlined in this section—stands compatible with the datum that those with self-reported philosophical expertise do in fact attribute knowledge-that *to some extent* in environmental luck cases, a datum that was also reported in a recent study by Horvath and Wiegmann (2016).<sup>43</sup>

To be clear, our positive narrative advanced in this section, as a candidate way of making sense of the patterns of attribution of knowledge-that, knowledge-how and understanding by those with self-reported philosophical training, is compatible with recognising this much while at the same time highlighting the comparative *differences* on this score between the judgments of those with and without philosophical training and what these differences might indicate. It is also not meant to rule out the possibility of other reasonable explanations of the data.

More generally, we've highlighted the cognitive achievement narrative as at least a potential interesting explanation for how the experimental results reported by those with self-reported philosophical expertise, beyond just that they do not fit well (as the results from those with no self-reported philosophical training do) with reductionist accounts of knowledge-how and understanding-why. In this respect, we see how the results reported by those with philosophical training might also but lend some credibility to a certain kind of rival account of contemporary interest. This positive point, we think, is best appreciated however not against the backdrop of any particular substantive way of thinking about the comparative evidential weight of philosophical intuitions versus folk intuitions, but rather more modestly alongside J. L. Austin's (1956) point that while ordinary language can lay claim to being the first word, it cannot lay claim to being the last.

We want to conclude this section by noting how our results interface with results on understanding and luck reported in interesting recent work by Wilkenfeld et al. (Forthcoming).<sup>44</sup> The objective of this work was, in the main, to adjudicate

<sup>42</sup> For example, with reference to the modal account of safety, a barn-façade style (i.e., environmentally lucky) belief might be such that it's non-occurrence in nearby worlds mimics the modal profile of an unsafe event, unsafe due to intervening luck, where the luck at play does (unlike in environmental-luck cases) change the explanation for why the belief is true.

<sup>43</sup> This was despite the fact that, as Horvath & Weigmann (2016) reported, epistemological experts' intuitions were noted as superior to lay intuitions in other respects.

<sup>44</sup> Of particular interest in Wilkenfeld et al's study was that—contrary to the what appeared to be the exhaustive options in the initial dialectical situation between Grimm (2006) and Kvanvig (2003)—folk judgments actually supported *neither* Kvanvig nor Grimm entirely. Kvanvig took it that understanding is compatible with knowledge-undermining epistemic luck. Grimm took it that the kind of epistemic luck that undermines knowledge also (*contra* Kvanvig) undermines understanding. Wilkenfeld's study indicates that the folk think that *neither* knowledge nor understanding-why are undermined in the particular kinds of cases described.

experimentally a dispute between Kvanvig (2003) and Grimm (2006) about whether luck cases show that understanding-why and knowledge-that come apart.<sup>45</sup> In particular, their position can be summarised as follows: ‘Kvanvig is right that attributions of understanding are relatively insensitive to luck (more specifically, to what we and others call “environmental luck”), but Grimm is right that attributions of understanding are no less sensitive to luck than attributions of knowledge.’<sup>46</sup> (Wilkenfeld et al. [forthcoming](#), 5) Our results largely comport with these findings in the specific case of folk attributions of understanding-why and propositional knowledge; those with little to no self-reported philosophical training were inclined to attribute not only understanding-why in the presence of environmental epistemic luck but also knowledge-that; however, our results caution against broader conclusions Wilkenfeld et al seem inclined to draw on the basis of the folk attributions reported. They write:

To the extent that we can read off our epistemic aims from our patterns of attribution, the findings rule out some possibilities—most notably that we use knowledge attributions, but not understanding attributions, to demarcate a particularly admissible etiological history. Our findings also suggest that we might do well to treat understanding and knowledge as roughly of a kind. (*Ibid.*, 27)

Given that expert patterns of attribution in fact differ importantly from folk patterns of attribution in a way that is relevant to whether understanding-why should be treated as a variety of propositional knowledge, we should at minimum address an interim epistemological problem before drawing as Wilkenfeld et al do the conclusion that we would do well to treat understanding and knowledge as roughly of a kind. And that interim epistemological problem would involve in some principled way adjudicating between the evidential weight of what we see are *competing* patterns (between experts and folk) of attribution that militate in different directions on the question of whether understanding-why and knowledge-that come apart. Such a problem, as we’ve noted

<sup>45</sup> We are grateful to an anonymous referee at *The Review of Philosophy and Psychology* for drawing our attention to this forthcoming paper. Note that these co-authors—Wilkenfeld et al. (2016)—have published a related paper on understanding which defends what they call ‘depth difference’—viz., according to which ‘people will be more willing to attribute knowledge-why than understanding-why in cases where someone has a true explanatory belief that is nevertheless fairly shallow.’ (2016, 374) Interestingly, they also present data (in their fourth of four experiments) that supports the view that ‘participants’ assessments of understanding [...] significantly correlated with their willingness to trust a character to handle a problem directly.’ (390) These are both highly interesting results; they indicate clear ways in which factors beyond luck can make a difference *vis-à-vis* the attribution of knowledge and understanding, respectively.

<sup>46</sup> Note that the particular kind of environmental luck case used by Wilkenfeld et al. ([forthcoming](#)) is Grimm’s (2006, 521) ‘Exploding Chestnuts’ case. There is an oddity about the case which may or may not be relevant to intuitive judgments about it. In typical environmental luck cases, the relationship between the agent and the reliable source of information (be it a fire officer in a testimony case or a genuine barn in a perceptual case) is such that things in fact go *normally*; the problem is that, due to the bad environment, things could very easily have gone awry such that the agent ended up believing incorrectly. In Grimm’s exploding chestnut case, a peculiarity is that things go *abnormally* in order to make it such that the blacksmith strikes the chestnut. The anvil *which is ordinarily heated* just so happens to not be heated on this occasion. By contrast, the testifier in Pritchard’s case ordinarily tells the truth and so is functioning normally when doing so, even when surrounded by liars. We are not sure what to make of this difference between Grimm’s particular environmental luck case and the cases Pritchard offers, however, we note it as a potentially interesting difference between the two.



in this section, is unavoidably tied to the deep and difficult issues canvassed concerning the viability of (and criticisms of) the expertise reply.<sup>47</sup>

## APPENDIX: VIGNETTES AND QUESTIONS.

(Comprehension and Demographic questions, and answer options, omitted for space after vignette 1)

### Vignette 1. Know how, Luck

We are interested in your views on what it takes to possess know-how (what you have when, for example, you know how to tie your shoe) as well as know-that (what you have when, for example, you know that Austria is located in Europe). So please read the following vignette and give us your answers to the questions below.

Charlie needs to learn how to change a lightbulb, and so he goes to the ‘how-to’ section in his local library. He finds a shelf full of identical looking books titled *Home Repair*. In each of these books are step-by-step instructions on the way to change a lightbulb – we’ll call the way the book describes way ‘w’. Unbeknownst to Charlie, all the copies of *Home Repair* on the shelf are fakes, except for one. Pranksters have placed these copies there, and these fake copies contain mistaken step-by-step instructions on the way to change a lightbulb. Since Charlie does not know this, he reaches up and grabs the copy of *Home Repair* nearest to him. By sheer luck, he selects the *only* copy in the entire library that contains genuine and reliable step-by-step instructions for changing a lightbulb, and he reads the correct step-by-step instructions on the way to change a lightbulb. Had Charlie picked up any of the other guides—which he so easily could have—he would have believed the mistaken instructions were correct.

All of the books surrounding the book Charlie chose were ‘fake guides.’

**True/False**

Upon consulting a copy of *Home Repair*, Charlie knew how to change a lightbulb.

**1 Strongly disagree; 2 Disagree; 3 Somewhat disagree; 4 Neutral; 5 Somewhat agree; 6 Agree; 7 Strongly agree**

Upon consulting a copy of *Home Repair*, Charlie knew that way *w* is a way to change a lightbulb.

**1 Strongly disagree; 2 Disagree; 3 Somewhat disagree; 4 Neutral; 5 Somewhat agree; 6 Agree; 7 Strongly agree**

Please indicate your nationality.

Please indicate your age.

Please indicate your gender.

**Male/Female**

<sup>47</sup> We are grateful to several reviewers from *The Review of Philosophy and Psychology* for detailed comments on previous versions of this paper.

What is your level of philosophical education?

**1 No education in philosophy; 2 Some undergraduate courses in philosophy; 3 Undergraduate major in philosophy; 4 Graduate courses in philosophy taken; 5 Master's degree in Philosophy; 6 Ph.D. in Philosophy**

What would you say is your level of expertise in the philosophical study of epistemology?

**1 I have a low degree of expertise in epistemology; 2 I have a moderate degree of expertise in epistemology; 3 I have a high degree of expertise in epistemology**

### Vignette 2. Know-how, No Luck

We are interested in your views on what it takes to possess know-how (what you have when, for example, you know how to tie your shoe) as well as know-that (what you have when, for example, you know that Austria is located in Europe). So please read the following vignette and give us your answers to the questions below.

Charlie needs to learn how to change a lightbulb, and so he goes to the 'how-to' section in his local library. He finds a shelf full of identical looking books titled *Home Repair*. In each of these books are step-by-step instructions on the way to change a lightbulb – we'll call the way the book describes way 'w'. Any of the copies of *Home Repair* on the shelf will give Charlie genuine and reliable step-by-step instructions. Charlie reaches up and grabs the copy of *Home Repair* nearest to him. So Charlie reads the correct step-by-step instructions on the way to change a lightbulb.

Upon consulting a copy of *Home Repair*, Charlie knew how to change a lightbulb.

Upon consulting a copy of *Home Repair*, Charlie knew that way *w* is a way to change a lightbulb.

### Vignette 3. Know-how, Luck

We are interested in your views on what it takes to possess know-how (what you have when, for example, you know how to tie your shoe) as well as know-that (what you have when, for example, you know that Austria is located in Europe). So please read the following vignette and give us your answers to the questions below.

Kenneth wants to learn how to build a kite, so he goes to the local Kite Club. When he gets there he sees a group of individuals wearing equally authoritative looking jackets bearing the Kite Club logo and the word 'expert'. Each of these individuals is prepared to give Kenneth instructions for building a kite – we'll call these instructions way 'k'. Unbeknownst to Kenneth, however, only *one* of these individuals is a genuine and reliable expert. All the other people there are simply passing through the Kite Club on their way to a fancy dress party. If Kenneth had consults any one of these people, they will give Kenneth defective kite-building instructions. Kenneth walks over to the individual nearest him, and inquires about building a kite. In response, this individual writes out step-by-step instructions on the way to build a kite. As it turns out, by sheer luck, the individual Kenneth approaches is the only genuine and reliable expert at the Kite Club. So the instructions Kenneth is provided are correct. Had Kenneth picked up

any of the other authoritative looking individuals to consult—which he so easily could have—he would have believed the mistaken instructions were correct.

Upon consulting the individual at the Kite Club, Kenneth knew how to build a kite.

Upon consulting the individual at the Kite Club, Kenneth knew that *k* is a way to build a kite.

#### Vignette 4. Know-how, No Luck

We are interested in your views on what it takes to possess know-how (what you have when, for example, you know how to tie your shoe) as well as know-that (what you have when, for example, you know that Austria is located in Europe). So please read the following vignette and give us your answers to the questions below.

Kenneth wants to learn how to build a kite, so he goes to the local Kite Club. When he gets there he sees a group of individuals wearing equally authoritative looking jackets bearing the Kite Club logo and the word ‘expert’. Each of these individuals is prepared to give Kenneth instructions for building a kite – we’ll call these instructions way ‘*k*’. Further, all of the individuals at the Kite Club wearing ‘expert’ jackets are in fact genuine and reliable experts, and any one of them will provide Kenneth with correct instructions. Kenneth walks over to the individual nearest him, and inquires about building a kite. In response, this individual writes out step-by-step instructions on the way to build a kite. The instructions Kenneth is provided are correct.

Upon consulting the individual at the Kite Club, Kenneth knew how to build a kite.

Upon consulting the individual at the Kite Club, Kenneth knew that *k* is a way to build a kite.

#### Vignette 5. Understand why, Luck

We are interested in your views on what it takes to possess know-that (what you have when, for example, you know that Austria is located in Europe) as well as what it takes to understand why (what you have when, for example, you understand why the church bell rings 9 times at 9 o’clock). So please read the following vignette and give us your answers to the questions below.

Fiona comes home to discover that her house has burned down, and so she seeks an explanation for the cause of the fire. On the scene are several equally authoritative looking individuals wearing fire officer uniforms. Each of these individuals is prepared to give Fiona an explanation for the cause of the fire. Unbeknownst to Fiona, however, only one of these individuals is a genuine fire officer. All of the others are simply >passing through on their way to a fancy dress party. These people look just like genuine fire officers, but will simply make up an explanation for the fire if asked. Fiona walks over to the individual nearest to her. This individual explains that it was faulty wiring that caused the fire. As it turns out, by sheer luck, this individual Fiona approaches is the *only* genuine fire officer on the scene. So the explanation Fiona receives is correct. Had Fiona picked up any of the other authoritative looking individuals to consult—which she so easily could have—she would have believed the mistaken instructions were correct.

Upon consulting the individual, Fiona understood why her house burned down.

Upon consulting the individual, Fiona knew that faulty wiring was the cause of the fire.

### Vignette 6. Understand Why, No Luck

We are interested in your views on what it takes to possess know-that (what you have when, for example, you know that Austria is located in Europe) as well as what it takes to understand why (what you have when, for example, you understand why the church bell rings 9 times at 9 o'clock). So please read the following vignette and give us your answers to the questions below.

Fiona comes home to discover that her house has burned down, and so she seeks an explanation for the cause of the fire. On the scene are several equally authoritative looking individuals wearing fire officer uniforms. Each of these individuals is prepared to give Fiona an explanation for the cause of the fire. Further, all of the individuals wearing fire officer uniforms are genuine and reliable fire officers, and any one of them will offer her the correct explanation of the cause of the fire. Fiona walks over to the individual nearest to her. This individual explains that it was faulty wiring that caused the fire. The explanation Fiona receives is correct.

Upon consulting the individual, Fiona understood why her house burned down.

Upon consulting the individual, Fiona knew that faulty wiring was the cause of the fire.

### Vignette 7. Understand Why, Luck

We are interested in your views on what it takes to possess know-that (what you have when, for example, you know that Austria is located in Europe) as well as what it takes to understand why (what you have when, for example, you understand why the church bell rings 9 times at 9 o'clock). So please read the following vignette and give us your answers to the questions below.

Kate is a scientist who seeks an explanation for why a certain chemical reaction occurred. She ordinarily uses a particular kind of instrument to conduct the relevant test, and there are several such instruments, indistinguishable from one another, on the table before her. Unbeknownst to Kate, however, all of the instruments in front of her have been tampered with, except one. If she uses any of the instruments that have been tampered with, they will tell her that it was the presence of hydrogen, rather than oxygen, that caused the reaction. Kate selects the instrument nearest to her, conducts the test, and as a result comes to believe that it was the presence of oxygen that caused the chemical reaction. As it turns out, by sheer luck, the instrument Kate selects is the *only* reliable instrument on the table, and it gives Kate the correct result. Had Kate picked up any of the other instruments—which she so easily could have—she would have believed falsely what caused the reaction.

Upon receiving the result of the test she conducted, Kate understood why the chemical reaction occurred.

Upon receiving the result of the test she conducted, Kate knew that it was the presence of oxygen which caused the chemical reaction.

### Vignette 8. Understand Why, No Luck

We are interested in your views on what it takes to possess know-that (what you have when, for example, you know that Austria is located in Europe) as well as what it takes to understand why (what you have when, for example, you understand why the

church bell rings 9 times at 9 o'clock). So please read the following vignette and give us your answers to the questions below.

Kate is a scientist who seeks an explanation for why a certain chemical reaction occurred. She ordinarily uses a particular kind of instrument to conduct the relevant test, and there are several such instruments, indistinguishable from one another, on the table before her. Further, all of the instruments on the table are reliable, such that conducting her test with any one of them will generate the same correct result. Kate selects the instrument nearest to her, conducts the test, and as a result comes to believe that it was the presence of oxygen that caused the chemical reaction. Since the instrument is reliable, it gives Kate the correct result.

Upon receiving the result of the test she conducted, Kate understood why the chemical reaction occurred.

Upon receiving the result of the test she conducted, Kate knew that it was the presence of oxygen which caused the chemical reaction.

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