

Against the Total Evidence Requirement

1. Introduction

Many philosophers endorse the requirement that one's total evidence is what matters when confirming a hypothesis or justifying a belief:

(TER) The credence or degree of belief it is rational to give p is determined by the support p receives from one's total available evidence.

The *total evidence requirement* (TER) is used in confirmation theory/inductive logic¹, and it is commonly invoked in epistemology.² A problem with the use of TER in these domains is that it is often used without defense.³ To show that invoking TER without defense can wreak havoc on a philosopher's thesis I will look at Timothy Williamson's account of knowledge.

A strategy to undermine a philosophical account, say of knowledge, is to undermine TER as used within that account. Williamson's account of knowledge provides an example of how this strategy might go. For Williamson one's total knowledge is equated with one's total evidence. The $E = K$ equation depends on TER. If knowledge is defined in terms of all true propositions, then in order for $E = K$ to be consistent evidence must be defined in terms of all of one's available evidence. Evidence would not equal knowledge if what counted as evidence was only a subset of one's total evidence. Because TER is a central notion in $E = K$ if

¹ For example, see Carnap 1962, Hempel 1965, Salmon 1967, Sober 1975, Achinstein 1983, Fetzer and Almeder 1993, and Maher 1996.

² See, for example, Davidson 1985: 141-142, Adler 1989, Moser 1989: 42, Williamson 2000: 189, Noordhof 2003: 76, Whitcomb 2008: 163, and Kelly 2008: 938-939.

³ This problem was identified at least as far back as Ayer 1972: 55-57, yet the use of TER without adequate defense of the requirement persists to this day (e.g., Maher 1996 and Kelly 2008).

one can undermine TER one can undermine $E = K$. An argument to this effect might run as follows:

1. $E = K$. (assumption)
2. What counts as evidence is one's total available evidence. (TER)
3. One's total available evidence is *all* the true propositions one knows.
4. TER is interpreted numerically. (2,3)
5. The numerical interpretation of TER is false. (\sim 4)
6. Thus, it is false that $E = K$.

Knowing for Williamson is a factive mental state. It is not a matter of knowing that one knows but only being in possession of the facts.⁴ The numerical interpretation of TER is understood in relation to *all* knowable facts. This makes *all the available evidence* consist of a large conjunction of facts. If I have just flipped a coin and it landed on tails it might be that my total evidence is the proposition that *the coin landed tails*. However, *all* the facts is also going to include propositions about the observational facts I acquired while flipping the coin (e.g., that the coin made a certain sound, stayed on the table as it bounced and flipped, came to rest tail-side up, and so on). The conjunction of facts might also contain an infinite number of *de se* propositions about what I learned (i.e., I learned that the coin landed tails, I learned that I learned that the coin landed tails, and so on). TER might be satisfied at the infinite intersection of all these known facts.⁵ Williamson imported TER from Rudolf Carnap, but all the known facts cannot be represented in a Carnapian language because his languages are finite in length and the proposition trying to be represented is infinite.⁶

An alternative to affirming premise 4 is to interpret TER in terms of relevance. Perhaps one's body of evidence is made manageable using judgments of relevance. The authors Williamson cites in mentioning TER subscribe to such

⁴ This is an externalist model of epistemic justification.

⁵ These points are from Hájek 2007.

⁶ It is not clear that Williamson's epistemic probability or knowledge-first epistemology contains a language for expressing the infinite intersection of all known propositions for a subject. Given Williamson's formulation of assertion it seems he is committed to a language that is finite in length.

an interpretation. This, however, will not work for Williamson because Williamson is only using TER in relation to the first relatum in the evidence-for relation. The *evidence-for relation* (EfR) indicates when e is evidence for a hypothesis h . This relation for a subject S is:

$$\text{(EfR)} \quad e \text{ is evidence for } h \text{ for } S \text{ if and only if } S\text{'s evidence includes } e \text{ and } P(h|e) > P(h).^7$$

The first relatum of EfR is *S's evidence includes e*. The first relatum is satisfied by determining what counts as evidence. For Williamson, this involves a theory of evidence. By contrast, those who endorse a relevance interpretation of TER endorse it in relation to the second relatum of EfR.⁸ As explained by Kirk Fitzhugh, "Evidence is said to be relevant to the belief in a particular conclusion if the inclusion of that evidence in an inference, or its exclusion, has either a positive or negative effect on the confirmation of, or support for, that conclusion."⁹ For Williamson total relevant evidence cannot be included in the probability distribution P (i.e., the second relatum) because doing so would generate something like the problem of old evidence. If using the notion of relevance to explain total evidence is not an option for Williamson, he must either (i) defend the numerical interpretation of TER by expressing all known propositions in a language of infinite length, or (ii) propose another interpretation of TER able to square with the first relatum in EfR and his favored theory of evidence.

The purpose of the foregoing argument has not been to argue against $E = K$.¹⁰ Rather I have sought to use $E = K$ as a theory of knowledge explicitly committed to TER and to show how TER must be explained and defended by Williamson if it is not going to create a liability for his overall theory.¹¹ Many philosophers wield TER as a dialectical tool in arguing for a certain conclusion or blocking a

⁷ Williamson 2000: 187.

⁸ The notion of adopting *all relevant evidence* instead of *all available evidence* is endorsed by Carnap 1962, Hempel 1965, and Fetzer and Almeder 1993.

⁹ Fitzhugh 2006: 312.

¹⁰ For a direct argument against $E = K$ in light of TER see Kaplan 2003: 113-115.

¹¹ See Neta 2008 for an argument that uses TER against Williamson's idea that one's evidence consists only of the propositions one knows to be true.

certain objection, but TER is not always defended or explained. It is frequently assumed to be true and a data point any acceptable theory of evidence must accommodate.¹²

In this paper I will argue that the practice mentioned above must end. Philosophers must argue for their favored interpretation of TER in order to purchase its use within a theory. In section 2 I will motivate the use of TER. Then, in section 3, I will discuss some options for interpreting TER and highlight problems with each interpretation. This shifts the burden of proof onto defenders of TER, and it makes it reasonable to abandon TER and formulate a viable alternative. In section 4 I formulate such an alternative, which is known as the *proportional evidence requirement* (PER). I continue refining and defending PER as an improvement over TER, and then in section 5 I conclude the paper.

2. The Motivation and Use of TER

There are at least two reasons why it is important to consider TER. The first is its connection to epistemic rationality, and the second is its connection to Bayesian epistemology. I will briefly explain each of these reasons.

TER is often linked to epistemic rationality. This type of rationality indicates how one ought to believe: one ought to believe propositions supported by one's evidence and not believe propositions not supported by one's evidence. If one is epistemically rational, then one ought to proportion one's belief in a hypothesis in accordance with the degree of support it receives from one's total evidence. Failing to invest one's confidence in a proposition in such a way makes one open to rational criticism.¹³ In failing to invest one's confidence in a proposition based on one's *total* evidence one has neglected to account for all relevant and available evidence. This means one's belief is less than fully rational because there may be evidence within the total evidence set which was not in the set of evidence

¹² Neta can be used as an illustration of this tendency based on his assertion that, "I will also, in what follows, assume that this requirement of total evidence (as I'm calling it) is true. In fact, not only do I take it to be true, but I take it to be a datum with which any acceptable philosophical account of evidence must be consistent" (Ibid: 90).

¹³ Ibid: 93. A related notion is *epistemic responsibility*. According to this notion one is responsible for believing or knowing in accordance with evidence that is both relevant and available (Gibbons 2006: 22-23).

consulted, and this evidence may contain a defeater or a proposition that would alter one's assignment of confidence if one were to take it into consideration.¹⁴ So, it seems to believe in accordance with epistemic rationality requires considering one's total evidence.

Along with epistemic rationality, TER is often incorporated into probabilistic approaches to epistemology. For instance, one of the core tenants of Epistemic Bayesianism is the notion of *evidential probability* (EP):

(EP) At any time t , a rational believer's opinions can be faithfully modeled by a family of probability functions c_t , hereafter called her *credal state*, the members of which accurately reflect her *total evidence* at t .¹⁵

EP holds that a one's subjective probabilities reflect one's total evidence. There are three probabilistic dimensions that model one's total evidence: *balance*, *weight*, and *specificity*.¹⁶ These three components explain how it is possible to model the support for a hypothesis received by one's total evidence. However, showing that it is possible to model one's evidence in such a way does not defend total evidence as that which should be modeled. Without specifically defending the notion of total evidence Bayesian Epistemology is open to being undermined from its foundations. Bayesian updating (i.e., learning) and confirmation hinge on EP; they only make sense if credences can accurately reflect one's total evidence. If, however, total evidence is problematic, then Bayesianism (and most *degree of belief* epistemologies) face a crisis—modeling probabilities in relation to total evidence is misguided because EP, learning and confirmation are based on a problematic notion. Thus, a motivation for defending total evidence is that it is used as a foundation for what one's degrees of belief should reflect. If total

¹⁴ This can also be understood with regard to the fallacy of exclusion. In this fallacy important evidence is excluded from consideration. Such evidence, if included, would undermine the inductive argument (i.e., change its conclusion).

¹⁵ Joyce 2005: 153.

¹⁶ Ibid: 154. The *balance* of the evidence indicates how the total evidence relates to individual probability values (i.e., how probable a proposition is given the total evidence). The *weight* of the evidence indicates how much relevant evidence is available. The *specificity* of the evidence shows how distinctly the evidence points to the truth of a proposition as compared to alternatives.

evidence can be undermined, Bayesian Epistemology must be reevaluated from the ground up.¹⁷

3. Interpretations of TER

In this section I am going to consider alternative interpretations of TER. By showing that each interpretation of TER is problematic in important ways I will apply pressure to abandon TER pending further defense. Each interpretation of TER is seeking to answer the following question: What understanding of *total* evidence generates a rational epistemic norm? Such a norm can guide one to the correct assignment of belief in a proposition in relation to a body of evidence. The norm indicates what gets included in the body of evidence consulted. This is important because, as Williamson states, “If too much or too little is counted as evidence, inductive principles will be misapplied.”¹⁸ Making a warranted inductive inference requires correctly itemizing the evidence.

As indicated earlier, an interpretation of TER with a great deal of historical backing is the *relevant evidence* interpretation. Evidence is relevant if it changes the degree of belief or confirmation assigned to a belief or hypothesis. This interpretation endorses the second relatum in EfR. This means a piece of evidence e is evidence for a hypothesis h if and only if the probability of h conditional on e is higher than the prior probability of h [i.e., $P(h|e) > P(h)$]. There are several problems with defining relevant evidence in such probabilistic terms.

Peter Achinstein argues that an increase in probability is neither necessary nor sufficient for something to count as evidence.¹⁹ Relevance is not sufficient for counting something as evidence because a lottery case can be used to show that believing someone will win the lottery because certain events have occurred is to believe something irrationally. In the case of John and Bill there were initially 1000 lottery tickets sold, and Bill bought 1 while John bought 100. Evidence e asserts that on a certain day all the tickets other people purchased were

¹⁷ It is also worth mentioning that TER is used to argue for and against positions in the philosophy of religion, formal epistemology, and the philosophy of biology.

¹⁸ Williamson 2000: 189. According to Williamson TER avoids mere verbal disputes between interlocutors who endorse different views about the nature of evidence. Instead, the disputes can be about what inductive conclusions are warranted given all known propositions.

¹⁹ Achinstein 1983: 150-157.

destroyed except the tickets held by John and Bill. One winner or lottery ticket will still be drawn at random. Imagine hypothesis h states that Bill will win. Does e , which increases the probability of h , count as evidence that h ? As it turns out, e is not sufficient evidence that h because the fact that e occurred is not evidence that h will occur. Using another example, driving increases the probability of getting in an accident, but the fact that one is driving is not evidence that one will get in an accident. Even when an event increases the probability of a certain outcome, the event occurring is not sufficient evidence that the outcome will occur. Achinstein uses two examples to show that relevance is not necessary for something to count as evidence.

Achinstein uses a version of *the paradox of ideal evidence* to show that it is not necessary for e to increase the probability of h in order for e to be evidence that h .²⁰ In such a “paradox” initial evidence is obtained followed by a second batch of ideal (i.e., identical in value) evidence. Even though the second batch of evidence does not change the balance of evidence (i.e., the degree of confirmation of the hypothesis), as Achinstein says, “this does not mean that the second batch of evidence is not evidence that h .”²¹ The second batch of evidence counts as evidence for h even though it simply increases the weight of evidence in favor of h . It might be unnecessary to obtain the second batch of evidence, but this does not mean it does not count as evidence. Without rehearsing the details, Achinstein provides a second lottery case that also shows that an increase in probability is not necessary for something to count as evidence.²² Perhaps, although, the theoretical problems with the *relevant evidence* interpretation of TER are based on a failure to account for an important distinction.

Carnap situates TER as a requirement on confirmation regarding *methodological* not *logical* problems of induction.²³ A *logical* problem concerns how to attach values to propositions given certain cases. A *methodological* problem concerns how to use inductive logic for certain purposes. Considering TER, within the context of methodology, it might prove a guide to what kinds of

²⁰ Ibid: 152. It is questionable whether this is a paradox. It is more like a counterintuitive result.

²¹ Ibid.

²² See Ibid: 152-153.

²³ Carnap 1962: 203.

things to do to get at relevant evidence for a hypothesis. Even if there are problems with the notion of *relevant evidence* in principle, such an interpretation of TER might prove useful in practice. According to Carnap, consulting total evidence is what is required when assigning degrees of confirmation during the, “application of inductive logic to a given knowledge situation.”²⁴ Is *relevant evidence* an interpretation of TER that works well in practice?

There are two problems with thinking of *relevant evidence* in terms of practical reasoning: (i) judgments of relevance conflict with TER as a norm of rationality and (ii) some evidence is relevant but unnecessary in knowledge situations. Regarding (i) it seems reasonable to define TER in terms of relevance as a way to pare down the body of evidence to a size that is manageable. This requires making judgments of relevance. Using judgments of relevance appears to generate circular reasoning. On Carnap’s model, inductive logic must be used to determine degrees of relevance. The problems associated with applying inductive logic then appear when making judgments of relevance. This requires solving the problems of inductive logic in order to use judgments of relevance in order to solve the problems of inductive logic.²⁵ Even if the practice of using judgments of relevance does not presuppose an inductive logic there is still a problem with forming judgments that certain evidence is irrelevant. Both the judgments of relevance and TER cannot be rational at the same time because sometimes they conflict. As Andrew McLaughlin indicates:

On one hand, if the use of judgments of relevance is not rational, then there appears to be no rational way of using inductive logic. On the other hand, if the use of judgments of relevance is rational, then the requirement of total evidence is not truly a norm of rationality.²⁶

The other problem with relevance is that some evidence is relevant but unnecessary. When one already has testimony from eight people that it will rain tomorrow (*h*) the testimony of a ninth person that agrees with the testimony of the prior eight is relevant to *h* but unnecessary. It does not seem a rational requirement for confirming a hypothesis that one must consult all corroborating

²⁴ Ibid: 211.

²⁵ McLaughlin 1970: 274.

²⁶ Ibid.

relevant evidence (beyond a certain weight of evidence threshold) in order to correctly assign degrees of confirmation. Such a requirement is irrational in light of practical rationality. Given the problems with *relevant evidence* both in principle and in practice it seems reasonable to consider other options.

Another possible interpretation of TER is *relative evidence*.²⁷ This interpretation is relativized to a knowledge situation. It asks an inquirer to form her judgments about degree of confirmation based on all evidence available at a given time. A problem with *relative evidence* is that it would be difficult and time-intensive to compile all evidence in a given situation. McLaughlin considers whether *relative evidence* can be understood of as an unattainable ideal that can be used as a standard of appraisal. The goal would be to approximate the ideal more and more closely. However, it would not always be rational to do so. As McLaughlin wonders, “isn’t it clear that no more evidence is needed concerning the hypothesis the sun rose February 12, 1943, or the hypothesis of special creation?”²⁸ A requirement to amass all information relative to a given situation is bound to prescribe irrational courses of action. It is not always rational to approximate the *relative evidence* interpretation of TER more closely.

Lastly, I will consider an alternative to TER called *the optimum evidence requirement* (OER). This is the requirement put forward by McLaughlin. Recognizing the tradeoff between inventorying all evidence and building scientific theories McLaughlin adopts something like the utility principle. According to this tradeoff one ought to capture the optimum amount of evidence in relation to the utility of possible outcomes. These outcomes are the utilities of tradeoffs given the truth or falsity of the hypothesis. The question becomes: what is the benefit and what is the cost for pursuing certain evidence in relation to resource expenditure (i.e., finances, time, cognitive resources, community resources, technical resources, and so on)? Trying to capture total evidence always runs into the wall of failing to account for the cost of seeking all evidence. OER accepts the fact that there is always a cost associated with capturing evidence. However, achieving the optimum level of evidence cannot avoid

²⁷ The primary historical precedence for this interpretation is Hempel 1965: 64. For a critical examination that rejects Hempel’s *relative evidence* see Adler 1989.

²⁸ McLaughlin 1970: 275.

reference to values. Assigning utilities to potential outcomes for accepting or rejecting a hypothesis, if the hypothesis is true or false, will require referencing the values of science. What values ought to guide rational inquiry? If a hypothesis is well-confirmed, yet an outstanding piece of evidence is novel, is it worth trading-off valuable resources (e.g., grant money, travel expenses, and research resources) to potentially add a new bit of evidence to the story of an already well-confirmed hypothesis? Is it worth filling-in gaps in a theory or are resources better spent developing a new theory? Though this approach pays homage to varieties of evidence and differing levels of confirmation within different scientific communities it does so at a high price.

There are three objections one could raise to OER. The first objection to OER is that it involves abandoning evidence as that which it is rational to believe on the basis of. Instead it is our judgments about evidence that determines what it is reasonable to believe. Value judgments about evidence decide what counts as evidence based on optimum levels. What resources one values determines the utilities attached to the outcomes. This leads to a pronounced form of value-laden judgments, which may conflict with the aims of rational scientific inquiry. Values will set the course of action for pursuing the optimum level of evidence instead of following the evidence wherever it may lead. A related objection is the incommensurability of values. How does one attach a utility to rejecting, for instance, string theory in physics with regard to potential future benefits from developing the theory versus the cost of pursuing the nascent evidence that could potentially confirm the theory? Is the value of cognitive resources (e.g., brain drain) comparable to the value of finances (e.g., financial expenditure)? Can a dollar amount be attached to creativity and the value of dedicating intellectual resources to a given project in relation to the potential evidence to be gained? A final objection is the sheer difficulty of performing a cost-benefit analysis on the possible outcomes for accepting or rejecting a hypothesis when it is true and when it is false. Despite the theoretical problems with OER it does not seem more applicable in practice than TER. In a knowledge situation it might not be rational to calculate the optimum level of evidence. Due to the complexity of such a calculation OER might be a requirement that is as demanding, if not more demanding, than requiring people to inventory all evidence.

4. The Proportional Evidence Requirement

Before providing my alternative to TER it is important to clarify the objectives of a successful alternative. The objectives for a requirement on evidence are:

- A. Evidence is factive (i.e., objectively true in an externalist sense), but it is not equated with all known propositions.²⁹
- B. Evidence must be properly itemized if inductive principles are to be correctly applied in a knowledge situation.
- C. Whether evidence is relevant cannot be simply associated with an increase in the probability of a hypothesis given the evidence.
- D. There must be a way to account for evidence that does not increase the probability of a hypothesis but the evidence is evidence nonetheless.
- E. There must be a way of handling relevant but unnecessary evidence.
- F. The requirement must not violate practical rationality by imposing obligations on action that are impossible to fulfill in practice.³⁰
- G. The requirement must avoid being ultimately ground in value judgments.

To understand how to generate a successful alternative to TER it is useful to look at how TER is defended. Thomas Kelly argues for TER as a necessary requirement on what it is reasonable to believe in light of one's evidence.³¹ Kelly uses *the butler case* to show that total relevant evidence must be consulted if one is to believe rationally on the basis of one's evidence. If the initial evidence against the butler's guilt is that the butler's fingerprints were on the murder weapon (e_1), and the butler's blood was at the crime scene (e_2), then it is reasonable to believe the butler committed the murder. If someone confesses to framing the butler (e_3), then e_3 acts as a defeater against the belief that the butler committed the crime. If it is later discovered that the confession of the framing of the butler was coerced

²⁹ This avoids the problem of being unable to use a finite language to express all known propositions. The requirement for *all known propositions* comes out of equating knowledge with evidence and requiring evidence to be *total* evidence so it can be equated with *all* known propositions.

³⁰ This aligns the requirement with the *ought implies can* principle. A complaint against TER is that it is a chronic violator of *ought implies can* (Adler 1989: 227).

³¹ Kelly 2008: 937-939.

(e_4), then e_4 defeats e_3 and reinstates the belief that the butler committed the crime. Failing to account for defeaters by only consulting a subset of one's total evidence is thought to result in unreasonable or irrational belief given the total available evidence. The problem with *the butler case* is that it is oversimplified. As you may recall, relevant evidence is evidence that increases or decreases the probability of a hypothesis. Relevant evidence does not consist only of defeaters. Relevant evidence also consists of undercutters or beliefs that impact the probability of the hypothesis without altogether undermining it. The total evidence in *the butler case* would also consist of beliefs about how the fingerprints were found on the murder weapon, how the fingerprints were confirmed as the butler's, how the blood found at the crime scene was identified as the butler's. Some of these beliefs might undercut the primary beliefs e_1 and e_2 to some degree. This impact on the assignment of probability values to e_1 and e_2 may make it the case that e_3 and e_4 function differently when introduced to the total evidence set. The result is that what it is reasonable to believe on the basis of the evidence is altered by actually including the total relevant evidence in *the butler case* and not just the flashy or obvious defeaters.³² Kelly gets his conclusion in support of TER because the example is stripped of a large number of relevant beliefs. The weight of the evidence (i.e., the amount of evidence) is kept low so that the introduction of each successive belief has the effect of acting as a defeater.³³ This requires Kelly to subscribe to the idea that evidence is relevant only if it can defeat a hypothesis, and evidence is irrelevant if it only undercuts a hypothesis or has a negligible impact on a hypothesis. Aside from the theoretical

³² In addition, the total evidence must be assessed in light of many background beliefs. These beliefs might include beliefs about the reliability of dusting for fingerprints on a murder weapon, the reliability of identifying blood found at a crime scene, and so on. If the butler was on trial for murder his defense attorney would likely use the background beliefs coupled with the undercutting beliefs to try and show that the vast number of undercutters undermines the beliefs taken to be highly probable. This is how the evidence is called into question, and surely the defense would not exclude such admissible evidence. TER cannot be defended using a sterile, oversimplified case. Kelly needs to explain how evidence with an undercutting or negligible impact on a hypothesis is irrelevant, and, thus, why it can be discarded from the total evidence.

³³ The conclusion, then, is that one must always consider the total evidence because otherwise one could miss a defeater and form an unreasonable belief because it neglects to account for something important to what it is reasonable to believe about the hypothesis.

problems raised earlier, which Kelly's notion of relevance does not avoid³⁴, there is another problem with such an account. If TER is limited to evidence with a significant impact on a hypothesis, then evidence will be excluded as irrelevant the addition of which could add-up to having a significant impact on a hypothesis. This will occur in cases like *the butler case* where the initial weight of evidence is low, and the introduction of a succession of undercutters could add-up to defeat the hypothesis. Imagine that Kelly concedes this point and falls in-line with tradition in claiming that evidence with any impact, however negligible, should be included in the total evidence. In such a case, when the weight of evidence is high, then TER will prescribe irrational action by requiring one to inventory things that do not matter in relation to confirming the hypothesis. The moral of the story is that a successful requirement on evidence needs to establish a relationship between the weight of the evidence for a hypothesis and what one ought to count as evidence. To do this I introduce the *proportional evidence requirement* (PER):

(PER) The credence it is rational to give a hypothesis h is determined by the support h receives from one's proportional evidence.

Evidence is included in the body of evidence in proportion to the weight of evidence. The following principles of proportion guide such determinations:

W_H When the weight of evidence is high: 1) A piece of evidence e_s with a significant impact on a hypothesis (i.e., an impact above a certain threshold) should be included in the body of evidence, 2) A piece of evidence e_i with an insignificant impact on a hypothesis should be excluded from the body of evidence.

W_L When the weight of evidence is low: 1) A piece of evidence e_s with a significant impact on a hypothesis (i.e., an impact above a certain threshold) should be included in the body of evidence, 2) A piece of evidence e_i with an insignificant impact on a hypothesis should also be included in the body of evidence.

³⁴ For example, an increase in the probability of a hypothesis, regardless of how significant the increase, is neither necessary nor sufficient for something to count as evidence.

The two principles that accompany PER make it the case that what counts as evidence is determined in proportion to the weight of evidence.³⁵ This makes sense given the concepts of *balance* and *weight*.³⁶ The *balance of evidence* is reflected in the individual probability values or to what degree the body of evidence supports the hypothesis. The *weight of evidence* is reflected in how much evidence bears on the hypothesis in question. As more evidence is obtained the weight of evidence increases, but the balance of evidence might not also increase. This can happen when I flip a coin twice and get heads and tails and assign .5 as the credence for the next flip landing tails. If I flip the coin five hundred times and the coin exhibits the frequency expected of a fair coin it is reasonable to assign .5 as the credence for the next flip landing tails. The balance of evidence has not increased, even though the weight of evidence has. The weight of evidence is reflected in what it is reasonable to believe in light of new evidence.³⁷ Given these considerations a problem arises for PER.

Principle W_H prescribes excluding insignificant evidence when the weight of evidence is high. This seems to play into the hands of *the paradox of ideal evidence*. When the prior weight of evidence is high and a second set of symmetrical evidence is introduced, which increase the weight but not the balance of evidence, W_H would council one not to count the additional evidence as evidence. Yet, it seems intuitive that the additional evidence is evidence. In fact, it is symmetrical in every way to the initial set of evidence. This means that the type of relevance PER prescribes does not represent an improvement over the type of relevance prescribed by the crude *increase in evidence* account (i.e., e is included in the body of evidence if it increases h 's probability). The second set of

³⁵ This also makes sense of Kelly's dilemma. Because in *the butler case* the weight of evidence is low the undercutting evidence regarding the reliability of the methods used to obtain the defeating evidence should be included in the body of evidence consulted, as W_L makes clear.

³⁶ Kelly 2008: 934-935. The examples that follow are also from the same location in Kelly 2008.

³⁷ For example, if I roll a single die nine times and the die lands on six all nine times it is reasonable to believe the die is weighted or unfair. If my prior credence in the hypothesis that *the die will land on six when it is rolled* was .17, and this credence is based on six rolls of the die, then the evidence of the additional nine rolls makes it reasonable to alter the credence significantly. But, if the prior credence is based on five hundred rolls of the die, then the evidence of the additional nine rolls makes it reasonable to alter the credence less significantly and think the die is probably not weighted; I just got lucky when rolling it the nine times.

evidence would be judged to be irrelevant, and it does not seem there would be a way to increase the weight of evidence in support of a hypothesis beyond a certain point. In fact, W_H would counsel against it. Though one is not required to obtain the second set of evidence if the first set of evidence has already been obtained, this does not mean that the second set of evidence is not evidence for the hypothesis.³⁸ Though PER has reduced the workload and made for a more feasible requirement on evidence, it seems an additional dimension of evaluation is required if PER is to be an improvement over TER.

The intuition I seek to capture in better articulating the principles of PER is: if evidence is ideal or perfectly symmetrical, it is redundant. To increase the weight of evidence there must be a gain in explanatory capacity. Even if new evidence does not alter the credence it is reasonable to ascribe to the hypothesis it may increase the weight of evidence while at the same time adding further explanatory coverage in support of the hypothesis. This happens when there is an explanatory connection between the truth of h and e . Even insignificant or identical evidence may have an explanatory connection to the hypothesis. If new evidence is identical in what it does to the credence of the hypothesis when compared to other relevant evidence, yet the new evidence adds to the ability of the body of evidence to explain the truth of the hypothesis, then the new evidence should be included in the body of evidence consulted. An example of this comes from Achinstein:

- e₁: *The New York Times* reports that Bill Clinton owns all but one of the 100 million tickets sold in the lottery.
- e₂: *The Washington Post* reports that Bill Clinton owns all but one of the 100 million tickets sold in the lottery.
- b: This is a fair lottery in which one ticket drawn at random will win.
- h: Bill Clinton will win the lottery.³⁹

An account of what counts as evidence that relies only on an *increase in probability* condition coupled with a *direct knowledge from experience* condition⁴⁰ would not

³⁸ Achinstein 1983: 152.

³⁹ Achinstein 1996: 179.

⁴⁰ Such an account is found in Maher 1996.

count e_2 as evidence that h because e_2 does not increase the probability of h conditional on $e_1 \& b$. In Achinstein's estimation e_2 is evidence that h because e_2 provides a reason to believe h .⁴¹ I can get at the same idea by saying that though e_2 fails to increase h 's probability (conditional on $e_1 \& b$) e_2 increases the explanatory coverage in support of h . Not only does the *Times* claim that Clinton owns all lottery tickets but one, but the *Post* says the same thing. The revision to the PER principle W_H is as follows (additions in italics):

W_H When the weight of evidence is high: 1) A piece of evidence e_s with a significant impact on a hypothesis (i.e., an impact above a certain threshold) should be included in the body of evidence, 2) A piece of evidence e_i with an insignificant impact on a hypothesis that is *identical in form and content as prior evidence* should be excluded from the body of evidence, 3) *When a piece of evidence e_i with an insignificant impact on a hypothesis is not identical in form and content to prior evidence, but expands the explanatory coverage for the truth of h , the evidence should be included in the body of evidence.*

This has the following effect on examples earlier in this paper: in the example of additional testimony from a different person that corroborates prior testimony it should be included (i.e., this information is now relevant and necessary), and in the ideal evidence paradox the second set of evidence should not be included. This validates Achinstein's recognition that, "To be sure, if we have already obtained the first batch of evidence there may be no need to obtain the second."⁴² In the paradox of ideal evidence the two sets of evidence are identical in form and content (i.e., both sets of evidence consist of 5000 spins of a roulette wheel where the ball lands on numbers different than three 35/36^{ths} of the time).⁴³ Such additional information is redundant and does not expand the explanatory capacity of the hypothesis. In addition, because the weight of evidence is already high given the first set of evidence (i.e., 5000 spins) there is no additional requirement to obtain further evidence to increase the weight of evidence. To require another 5000 spins or include the second set of 5000 spins in the evidence

⁴¹ For more on this see Achinstein 1996: 178-179.

⁴² Achinstein 1983: 152.

⁴³ For an argument against this ideal evidence paradox see Kronz 1992: 163-164.

is irrational because it imposes an unnecessary requirement on the obtaining of evidence. This does not mean that the evidence disregarded is not evidence for the hypothesis. It just means that in this knowledge situation there is no rational requirement to count that evidence as such.

Now that I have revised the notion of relevance and made it proportional to the weight of evidence and the explanatory scope of the evidence, the last outstanding objective A involves revising the notion of what evidence is relative to. This involves a shift from subjective probability to objective probability. Or, in epistemic terms, this involves a shift from internalist epistemic justification to externalist epistemic justification. Must an inquirer have access to the evidence or know that the evidence is true? Or, is it sufficient that the evidence is true, but it is not required that the evidence is known to be true?

Most of the difficulties presented in section 3 of this paper centered on an inability to gain proper access to the evidence, either cognitively or pragmatically. This assumes an internalist picture of evidence. That is, evidence is relative to the stuff inside our head, and whether we have obtained evidence depends on whether we can access the evidence in a possible or feasible way. Williamson subscribes to an externalist picture of knowledge. What we know is determined by the facts (i.e., the true propositions). The problem with Williamson's approach is that he equates evidence with knowledge and requires evidence to consist of all known propositions. This generates the problem with expressing the infinite intersection of all facts known by a person in a given mental state using a finite language. Now that TER has been replaced by PER there is not a requirement to represent all known facts. All that needs to be represented are the relevant facts or the facts in accordance with the two principles in (PER). This leaves open the possibility of subscribing to an externalist notion of evidence in order to satisfy objective A, yet using a finite language to represent the facts because the size of the body of evidence is made manageable by the notion of relevance.

Due to space limitations I will not be able to fully develop the notion of the factivity of evidence, but let me point in the direction of such an account by using some of the work of Achinstein. For Achinstein, it is not the case that one must know that a piece of evidence is true, rather the evidence must in fact be true. The evidence does not need to be known to be true by any person or

community.⁴⁴ On such a definition it is perfectly admissible for an inquirer to believe that evidence is true, but what a person believes to be true, and how this belief impacts a hypothesis in light of the proportional evidence, is relative to whether the evidence is in fact true—not whether the evidence is believed to be true or is true simply because it is believed. Such a shift can be understood as a move to the notion of *potential evidence*. Maya Bar-Hillel and Avishai Margalit have done a good job outlining Achinstein’s proposal. Something counts as potential evidence *e* that *h* if and only if:

- (a) *e* is true,
- (b) *e* does not entail *h*,
- (c) the probability of *h* on the basis of *e* is larger than some predetermine threshold value *k*,
- (d) the probability that there is some explanatory connection between *h* and *e*, given that both are true, is larger than that same threshold value.⁴⁵

To use the notion of *potential evidence* within PER the threshold value *k* in (c) and (d) must also account for the weight of evidence. This involves rigorously specifying how *k* changes given differing values in the balance of evidence relative to differing values in the weight of evidence. Such a project, however, is beyond the scope of the current paper.

5. Conclusion

When someone violates the *total evidence requirement* (TER) this is taken to be a bad thing and counts against that theory or argument. Such a use of TER is illegitimate without defending the requirement itself. In this paper I presented reasons to think that all interpretations of TER are problematic. This motivated a move to a different requirement on evidence that overcame the shortfalls of TER. To this end, I introduced the notion of the *proportional evidence requirement* (PER). This requirement seemed to be an upgrade over TER because it instructed one on how to decide what counts as evidence in a way that is rational from a theoretical

⁴⁴ Achinstein 1996: 180. This could be understood as a version of the anti-luminosity thesis. For details on such a thesis see Williamson 2000: Ch. 4.

⁴⁵ Bar-Hillel and Margalit 1979: 576.

and a practical perspective. I noticed, however, that PER did not constitute an upgrade over TER unless it could properly handle examples that counted against TER or any notion based on a crude *increase in probability* as the hallmark of evidence. After overcoming this hurdle I recognized the need to move beyond an internalist rendering of a requirement on evidence. Such a move involved invoking the notion of *potential evidence* as described by Achinstein. Doing this captured the thrust of Williamson's account of evidence without incurring one of its undesirable theoretical consequences. More work remains to be done in further delineating and defending the factive notion of evidence and PER against any potential counterexamples that may arise.

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