JYX JYVÄSKYLÄN YLIOPISTO UNIVERSITY OF JYVÄSKYLÄ

This is a self-archived version of an original article. This version may differ from the original in pagination and typographic details.

Author(s): Tuominen, Miira; Kallio, Eeva K.

Title: Logical contradiction, contrary opposites, and epistemological relativism : Critical philosophical reflections on the psychological models of adult cognitive development

Year: 2020

Version: Accepted version (Final draft)

Copyright: © The contributors, 2020

Rights: In Copyright

Rights url: http://rightsstatements.org/page/InC/1.0/?language=en

Please cite the original version:

Tuominen, M., & Kallio, E. K. (2020). Logical contradiction, contrary opposites, and epistemological relativism : Critical philosophical reflections on the psychological models of adult cognitive development. In E. Kallio (Ed.), Development of adult thinking : Interdisciplinary perspectives on cognitive development and adult learning (Article 208-229). Routledge. https://doi.org/10.4324/9781315187464-13

Citation: Tuominen, M. & Kallio, E. K. (2020) Logical Contradiction, Contrary Opposites and Epistemological Relativism: Critical Philosophical Reflections on the Psychological Models of Adult Cognitive Development In Kallio, E. K. (Ed.). (2020). *Development of Adult Thinking: Interdisciplinary Perspectives on Cognitive Development and Adult Learning*. London: Routledge.

Miira Tuominen & Eeva K. Kallio

Logical Contradiction, Contrary Opposites and Epistemological Relativism: Critical Philosophical Reflections on the Psychological Models of Adult Cognitive Development[1]

Abstract

In this contribution, we argue that a philosophical clarification of the discussion of adult cognitive development in psychology is needed in order to get a clearer view of what is at stake in this debated phenomenon. On the one hand, we contend that rather than epistemological relativism, mature adult cognition should be described in terms of integration. Integration means understanding that people have different views with each other and from us, but we still need to respect them as persons and take their emotions into account. This does not mean simple acceptance of their views as true, as the descriptions of epistemological relativism would suggest. On the other hand, we argue that rather than calling for many-valued logic as some Piagetian views maintain, an adult way of thinking recognises that many conflicts are not logically exhaustive, i.e., that there are more than two solutions to a problem at hand. This often means a confusion between two kinds of opposition: contrary and contradictory. While the latter is logically exhaustive in two-valued logic (e.g., good and not-good), the former is not (e.g., good and bad). Our suggestion is that youthful absolutist cognition tends to see conflicts in terms of contrary opposites and assuming them to be logically exhaustive (there is no other solution). A mature adult way of thinking, by contrast, sees that such dichotomies are not logically exhaustive and even in situations in which we have not been able to figure out the solution, it is still possible to find it. Finally, we explore the possibility of articulating an adult way of thinking which recognises that one's own conceptions might not be insufficient or incorrect by a historical comparison to Ancient Skepticism.

Introduction

In recent decades, there has been a dominant tendency within psychological research to explain adult cognitive development by reference to some central notions and distinctions that are also central in philosophy such as epistemological relativism, deontological ethics, determinism and indeterminism, logical contradiction, and two-valued as opposed to many-valued logic. Although developmental models based on a strict division of distinct stages and phases are not unanimously accepted, youthful immature cognition is often distinguished from adult, mature cognition (Hoare, 2011; Kallio, 2001, 2011, 2015). More recently, this tendency has also, to some extent, given way to discussions about wisdom as a mature psychological achievement (Baltes & Staudinger, 2000; Trowbridge, 2011; Trowbridge & Ferrari, 2011; Edmondson, 2015; Curnow, 1999).

In this contribution, we shall first argue that the notions of epistemological relativism and tolerance to logical contradiction, even acceptance of many-valued logic, are not successful in explaining mature adult cognition, as viewed from a philosophical point of view. Rather, mature adult cognition should be characterised as the capacity to *integrate* distinct and diverse elements into one's own cognitive, emotional and action systems or perspectives (Kallio, 2011, 2016; see also e.g. Cavanaugh & Blanchard-Fields, 2014, p. 203 "integrated relativistic-dialectical thinking"). This, as we shall argue, does not mean simple acceptance of everyone's beliefs as true but refers rather to understanding the other person's point of view, emotional state and the background from which his/her beliefs have been formed. Finally, when such an integrative outlook is cultivated into the capacity of understanding views that are rather different from one's own, with the capacity to form one's own view based on such integration, such an outlook on the world starts to resemble (but is not identical with) what today is described as the cognitive component of wisdom (Grossmann, 2017).

Below we shall first consider the more distinctly cognitive elements in mature adult thinking through a philosophical critique of the central notions of developmental psychology. Then we shall argue that that philosophical critique of some core notions of the earlier theories and models leads to a more accurate description of adult cognition as integration.[2]

Our aim is to clarify how the philosophical analysis of logic, knowledge, and beliefs differs from the one of developmental psychology. In a nutshell, while developmental psychology mainly

focuses on empirical descriptions of the ways of in which people think and how their thinking develops, philosophical logic pertains to analysing the logical validity of inferences and arguments. If people have contradictory beliefs or make erroneous inferences, this does not have direct consequences for philosophical logic. Similarly, philosophical epistemology in its current standard form[3] focuses on the analysis of the concept of knowledge, its necessary and sufficient conditions, and this is typically quite far from the ways in which the notion of knowledge is used in ordinary language. This means that often the subject matters of philosophical analysis differ from that of developmental psychology: philosophical logic is concerned with logical validity while developmental psychology studies thinking in empirical subjects. However, even when the subject matter is partly the same – philosophers can of course be concerned with thinking as well – the approaches differ. To simplify, for developmental psychologists it is vital to find out how subjects use certain terms and how they think, and thinking is understood very broadly as referring to mental operations on a wide spectrum from sensations and perceptions to emotions, dreaming, and the use of concepts. Philosophers, by contrast, are focused more on the ways in which the notions should be used to preserve clarity and consistency and what kind of different mental operations should be distinguished and on what grounds.

We shall argue that, from the philosophical perspective, two central features of adult mature cognition can be traced: (i) the cognitive ability to see beyond simplified dichotomies,[4] and (ii) an attitude towards one's own beliefs that recognises the evidence and justification for them while allowing that a better, more detailed and accurate view is possible.[5] Such an attitude also recognises that we do not necessarily know how things are but without falling into cynical skepticism or 'anything goes' sort of relativism. With respect to point (i), youthful cognition can to an extent be characterised by a tendency to see stark oppositions and exhaustive dichotomies, while mature adult cognition means an ability to see that such dichotomies are not necessarily exhaustive. We shall also suggest that often this means a simple distinction, introduced by Aristotle (trans. 1984),[6] between contrary and contradictory opposites, in which contrary opposites (such as good and bad) do not exhaust the logical domain (something can be neutral), while contradictory opposites (good and not good) do so. A youthful attitude towards one's own beliefs or the beliefs taught by some authority (ii) can be described as certainty and dogmatism, whereas mature adults rather understand that it is possible to see matters differently, be mistaken in one's conceptions, or that authorities are not necessarily right or omniscient.

Problems in Describing Adult Cognitive Development: Philosophical Reflections

Adult Thinking as Development From Absolutism to Relativistic Thinking

The discussion about adult cognitive development in psychology typically refers to Perry's longitudinal study (1970) in which white male university students were interviewed about their conceptions of knowledge and how it is attained. In the study, the researchers monitored the change in students' conceptions of knowledge (and ethics) (Perry, 1970). The central result was that while young students had rather unreserved confidence in the truth of what they learned in class, when they matured they came to think that perhaps all that was taught was not true and started to trust their own abilities to critically evaluate the results, theories and models that they learned. On the basis of the findings, Perry proposed 9 distinct levels of knowledge formation, and important notions used to describe them include the following: dualism, multiplicity, and commitment to relativism (see also Chapter 3).

These findings have often been taken to support the claim that when the students learned more and got older, they became epistemological relativists. Another formulation is that first the students believed that there is only one truth and later became relativists about the truth. The mature way of thinking that the students allegedly reached is also often described as being dialectical. The term has various uses in the philosophical tradition, but in the context of developmental psychology it means the students' ability to create a synthesis of contradictory theses and antitheses, which also amounts to the ability to create a stable identity in the midst of multiple perspectives and views. Thus, it is claimed that, in the final phase, contradictions are overcome and mature adults use what is called 'dialectical logic' in the context (e.g., Basseches, 1984).

Perry's research is a study within the developmental psychological branch of epistemology which, despite the similarity of its name, is distinct from philosophical epistemology. Other models similar to Perry's have also been proposed, and some general characteristics of them synthesised (e.g., Kramer, 1983) (see e.g., Chapter 3 and 4 on different models). Kramer's formulations bear a terminological resemblance to descriptions of relativism in philosophical epistemology and, as mentioned, the term 'dialectic' that is often used in the psychological studies has many technical

uses in philosophy. Therefore, it is necessary to analyse what exactly is meant by the notions used in the discussion.

In the following, we will first focus on the concept of relativism as it is formulated in Kramer's analysis. It will be argued that a notion of relativism that resembles philosophical epistemological relativism is too vague to capture the core of the studied phenomenon, adult cognitive development. In section 2.3, a similar argument is made about logical contradiction as it appears in the descriptions of dialectical thinking in developmental psychology. In section 2.5, we argue that a philosophically more accurate description with more clearly defined terms can be given in terms of integration. As a whole, section 2 concentrates on arguing why a philosophical analysis of the central notions of psychological studies in the cognitive development of adults is vital for understanding the nature of this debated phenomenon.[7]

Philosophical and Psychological Epistemology

Epistemology as a branch of philosophy (*PhilEp*) and in its standard form in the latter half of the 20th century involves discussions about the necessary and sufficient conditions of knowledge, its definition, and the reliability of cognitive processes. By contrast, Perry and numerous scholars following him (such as Hofer and Pintrich, 1997; Baxter Magolda, 2004; Schommer-Aikins, 2004; Kuhn & Weinstock 2002; King & Kitchener, 2004, and others), work in a tradition of psychological epistemology (*PsyEp*) within which, like in philosophical epistemology as well, different views are presented by different scholars. As mentioned, the results of the *PsyEp* studies – especially Perry's (1970) – concern the attitudes of empirically studied groups of students towards their own views about knowledge. From a philosophical point of view, such results do not directly show how knowledge should be analysed and what conditions one should lay out for something to be knowledge. In this section, the basic notions of philosophical epistemology will be elucidated in a standard form that can be found in introductions to 20th-century Western philosophical epistemology. The *Stanford Encyclopedia of Philosophy*, for instance, contains easily accessible articles, references to which are given in the endnotes with respect to the themes discussed in the body text.

In the late twentieth century, philosophical epistemology broadly speaking focused on debating a notion of knowledge that is characterised by three conditions:

(KB) Knowledge is a form of belief.
(TB) Knowledge is true belief.
(W) A true belief that counts as knowledge must be *warranted*, i.e., it must be justified either directly by being self-evident or by a non-inferential cognitive process, or through valid inference from other justified beliefs.[8]

Philosophers have different views onf how exactly beliefs can be justified (i.e., warranted). One useful distinction is the one mentioned in the formulation of principle (W) above: beliefs can be justified directly through a cognitive process such as perception, or they can be justified through valid inference from other (directly or indirectly) justified beliefs. Typically, some logical principles are also included in the category of justified beliefs. Therefore, if one asks for the justification of my belief that there is a computer screen in front of me, many philosophers agree that the fact that I perceive a computer screen in front of me is sufficient to justify the claim. It is important to note, however, that justification is distinct from truth. Therefore, although my belief that there is a computer in front of me can be justified by reference to my perceiving it, my perception does not make my belief true. We can imagine some optical illusion or mirrors, for example, that create the impression that the screen is there although it in fact is not.

It is also important to note that, in the context of philosophical epistemology, a belief does not mean religious belief or faith but rather that someone takes something to be the case. If person a has a belief that *p*, *a* takes *p* to be true. Here *a* stands for an individual person and *p* for a proposition or statement, such as 'the earth moves', 'it is raining', or 'justice is good'. Therefore, I have a belief that it is raining (in place *x* at time *t*) when I take it to be true that it is raining in place *x* at time *t*. A proposition or statement (*p*) as the object of belief is expressed in natural language as an indicative sentence, as opposed to questions, prayers, exclamations, confessions and so on.

To see why *PsyEp*'s results do not have direct implications for the analysis of knowledge in the philosophical framework, we need to articulate one more principle.

(BNIT) *A* believes that *p* does not imply that *p* is true.

This principle can, in brief, be articulated as the obvious claim that belief does not imply truth.[9] From the fact that *a* believes *p* to be the case, it does not follow that *p* is the case. For example, if I believe (i.e., take it to be the case) that it is raining in Finland at place *x* a certain moment of time (*t*), it does not follow that it is raining in Finland at place *x* at time *t*. Whether my belief is true or not, depends on whether it is actually raining in Finland at that place and that moment or not.

This is relevant for the results of *PsyEp* studies for the following reason. For example, Perry's study concerns how students answer the questions about what they think (i.e., take to be the case) about the truth of what they learn in class. The result is that first students believed (i.e. took it to be the case) that what they learn at the university is true. Based on the principle explicated above (BNIT), this does not imply that what they learn at the university is true. Whether the contents taught are true or not, depends on how things are, not on whether students believe them to be true or not. Similarly, when the students become more critical towards university teaching, this does not make the contents taught change from true to false (or vice versa). If I stop believing that it is raining at place *x* at time *t*, my change of belief does not stop the rain.

In addition, it is worth pointing out that truth in the sense that it is used in philosophical epistemology does not come in degrees. Something can be more *like* the truth, *closer* to the truth, or more *likely* (i.e. more probable), but these are degrees of truth-likeness or probability, not of truth as such. Therefore, Perry's study (1970) and the studies of the scholars belonging to the same tradition do *not* show that university teaching would become *less true* as the students' confidence in it diminishes. It shows that the students' confidence in the truth of what is being taught to them diminishes and they start to have greater trust in their own critical ability to distinguish between what is true and what is not.

Dialectical Thinking

The notion of dialectical thinking has a long history both in the Eastern and Western cultural traditions (and perhaps in other cultures as well) and in philosophy (Spencer-Rodgers & Peng, 2018). However, there is no one definition of what exactly it is. Although as a philosophical term of art, 'dialectical' goes back to Plato (trans. 1997) and Aristotle (trans. 1984)[10], the first person to use the term 'dialectical thinking' as a form of adult cognitive development in psychology was Riegel (1973, 1976). His view was a counter-reaction to Piaget's (1976) theory and based on observing limitations to describing cognitive progress in adulthood with a two-valued logical system. Riegel maintains that there are certain dialectical tendencies in Piaget's theory, referring e.g. to the role of contradictions and internal play of assimilation and accommodation in knowledge formation (Piaget, 1976). However, Piaget's theory is, according to Riegel, metaphorically a *Homo ex Machina* -type theory.[11]

According to Riegel, "everything is itself and, at the same time, many other things." (Riegel, 1973, p. 6). He continues that while an object is identified as something, it is also something else, something contradictory to it from other viewpoints.[12] Only the totality of these separate, multiple views can yield at least an approximately coherent view of the phenomenon. Riegel assumes that a thing can only be understood in relation to its opposite, as in the famous Laozi's Dao De Jing's claim "Low is understood low only as there is highness". Two valued philosophical logic recognises these kinds of opposites, and in philosophical analysis such opposites are contrary, not contradictory. Contrary opposites are such that they can both be false (something can be in the middle in which case it is false that it is high and false that it is low).

This is important since Piaget (Inhelder & Piaget, 1958) seems to conflate such opposites with contradictory opposites (e.g., high and not high) that cannot be *true or false* at the same time. The problem in Piaget's theory of two-valued thinking is that it requires one to choose between two dichotomous alternatives that do not exhaust the logical domain. Often the problem is precisely that contrary opposites are taken to be contradictory, i.e., that it is assumed that binary thinking operates with contrasts like good and bad and forces one to choose between them, although it is possible that something is neutral (i.e., neither good nor bad). Philosophically speaking, terms like 'high' and 'low' can be understood in terms of relatives.[13] This means that they refer to something that is

defined and can be so only in relation to something else. Therefore, to say that something is high means that it is high in relation to something else (e.g., a branch of a tree is located high in relation to a worm on the ground) but low in relation to something else (e.g., the same branch of a tree is low in relation to the top of a skyscraper next door).

Piaget uses well-defined tasks to determine the cognitive stage of a subject. In well-defined tasks the proper action to solve them is to use what can be called 'binary propositional logic' following the law of excluded middle (Inhelder & Piaget, 1958). In well-defined problems, the problem-solver is given choices and it is clear from the beginning what factors must be taken into account to solve the problem, while ill-defined problems are unclear in this respect. From a philosophical point of view, the difference between the tasks is thus whether there is sufficient information and clear instructions for solving the problem. The proponents of a dialectical theory stress that human development as a socially-bound phenomenon naturally includes ill-defined, wicked problems and situations, i.e. problems without clear-cut answers. So the claim that mature thinking is dialectical is based on the impossibility to use what in cognitive psychology is called 'formal binary propositional logic' (Inhelder & Piaget, 1958), to solve problems for which there are no clear-cut solutions. In dialectical operations, an individual is able to tolerate contradiction and conflict and understand them as a necessary part for development. Change is thus the core term in dialectical thinking, as a human being is tied in social interaction to constant change (Riegel, 1973, 1976). A limitation in Piaget's theory is that it takes into account only interaction between human beings and physical objects (like in the Pendulum task, Chapter 3), not social life.

It is important to stress that Piaget's binary logic is not the same as two-valued logic in philosophy. While Piaget's binary logic has features of formalism, it is also a model for human problem-solving.[14] Philosophical logic, by contrast, is a theory of valid inference, where inferences are not thought processes. There are of course many different approaches to logic in philosophy today. However, their approach is different from psychological studies of human thinking precisely because they operate on the notion of logical validity constituted by what logically follows from other propositions.[15]

Beside its focus on ill-defined problems, there is certain "systemic-theory" tendency or analogy in the dialectical theory (see e.g., Chapter 12): "A dialectical theory of human development focuses on the simultaneous movements along at least the following four dimensions: (1) inner-biological, (2) individual-psychological, (3) cultural-sociological, and (4) outer-physical" (Riegel, 1976, p. 693). In describing human development the dialectal theory takes into consideration these different dimensions, which act like a synchronisation of separate but interdependent systems. These systems are more or less coordinated, and a state of disorganisation leads to conflicts and disruptions, either within a system or between systems. However, in an optimal case such conflicts can fuel further progress and development. Thus, a second argument for the dialectical theory of human development is that the same pattern of binary "logic" cannot be applied to different domains of thinking (mechanical vs. social), as a human being is situated in an intersection of various systems that are not reducible to each other.

A third argument for the dialectical theory of human development comes from the fact that the natural scientific view behind Piaget's theory is outdated. In an article from the early 1970s, Riegel (1973) refers to quantum physics and its claims of the contradictory nature of reality: light can be understood both as waves and particles, and the subject is always tied to the process of observation, i.e. object is influenced by subject (p. 347). This claim has been later used again by Sinnott in her "postformal theory" (see Chapter 12). According to Riegel, Piaget's theory with well-defined problems is based on classical, "old" theory of mechanics and may not express the current state of scientific world-view.

Basseches (1984, 2005), another main scholar of dialectical thinking in psychology, states clearly that he has derived his model from a dialectical philosophical background. He sees that, ontologically and epistemologically, dialectical thinking models share similar features: emphasis on change, on wholeness (as contrasted to atomism and variable-centred approach in classical mechanics), and on relations between objects: nothing exists for itself. Epistemologically, the first point refers to constant construction of knowledge, secondly, knowing is knowing only within some system as concepts and ideas which are tied to each other in the system. Also, concepts are in relationship to the knowers and users of them, and their meaning is related to knowers, and are not stable (Basseches, 2005, p. 50).[16]

Basseches separates formal and dialectical analyses of thinking. Formal analysis is based on closed system thought, and dialectical thinking is based on open system thinking. A closed formal system cannot take into account any other perspective than its own: thus it is powerless to understand different ways of understanding. Analyses of dialectical open-system thinking, by contrast, take into account the limits, contexts and boundaries of thinking and thus offer a more powerful method for development than formal analysis. Formal analysis is not able to take into account multiple, different frames of references, i.e., justifiable coherent ways of interpreting the same facts based on different assumptions: it does not take into account different processes of interpretation and meaning (Basseches, 2005).

Contradictory and Contrary Opposites in a Philosophical Analysis of Dialectical Thinking

One basic difference between philosophical logic and cognitive psychology is that while the latter concerns ways of thinking in the broad sense (including perceptions, emotions and dreaming) and strives to describe their characteristic features empirically, philosophical logic is a theory of valid inference, in which inference is not a thought process. This means that it is difficult if not impossible to derive conclusions pertaining to philosophical logic from how people, mature or immature, think. In the following, we shall describe this difficulty first from the viewpoint of the notion of contradiction that is also central in the above-described dialectical theories of human cognitive development.

In the psychological descriptions, mature adult ways of thinking are said to be more tolerant towards or even more capable of accepting logical contradictions (Kramer, 1983) than youthful ways of thinking. This might be taken to imply that mature adult thought is not logically two-valued. Two-valued logic acknowledges only two truth-values as possible: true or false. It is important to stress that this question is distinct from the question of whether and how we know which claims are true and which ones false. This means that a claim can have a truth-value even if we do not know what it is. This is because truth depends on how things are, not on whether we know how they are. If I do not know whether it is raining in Finland at place *x* June 30, 2017 at 13:45 Greenwich time – let us call this time *t* – it does not mean that the claim 'it is raining in Finland at place *x* at time *t*' would lack a truth-value, i.e., that it is not true or false. It simply means that I do not know whether it is true or not.[17]

In the psychological discussion of two-value *versus* many-valued logic, the cognitive development of adults has been compared to Hegel's 'logic' in which the Spirit progresses through thesis, antithesis, and synthesis and this is called 'dialectic' (Kramer, 1983, p. 94). It is important to note that Georg W. F. Hegel's 'logic' concerns the progress or development of Spirit through history, whereas philosophical logic, as generally understood, is a theory of valid inference.[18] Therefore, we shall use 'logic' in quotation marks here because Hegel's dialectic is not a logical theory in the sense of being a theory of valid inference. For developmental psychology and the philosophical analysis of its central notions, the important point is that a mature adult way of thinking will not assume that one must only accept either the thesis or the antithesis but aims at a wider synthesis of the claims made in both. As mentioned, this is sometimes taken to imply that mature adult thought is capable of embracing logical contradictions (Basseches, 1984). Next it will be argued why we should avoid such a description and rather maintain that adult cognition is capable of recognising contradictions that are only apparent and making a difference between contrary and contradictory opposites.

Let us consider the following example to illustrate the claim. Imagine a community in which the notion of orange colour is not known and two members of the community are debating about the colour of oranges (the fruit).[19] One is arguing that oranges are yellow, the other one that they are red. This is a contradiction in the sense that the claim that oranges are yellow and that they are red cannot be true at the same time. However, it is not such a contradiction that exhausts a two-valued logical space (yellow and not yellow) and therefore no third truth-value needs to be introduced in addition to truth and falsity. This is simply because both claims (i.e., the one that oranges are yellow and the one that they are red) are false. Let us then assume that a third person from outside the community enters the scene and says that the colour is orange. This new, enhanced conception of the colour in a sense incorporates the two antithetical views within it because the orange colour is a mixture of yellow and red. However, no many-valued logic is needed to analyse this example because the new claim (oranges are orange) is true, whereas both the antithetical claims (oranges are red, oranges are yellow) are false. Those views are, in a sense, closer to truth than the claim that oranges are black, for example, but this observation causes no problems for two-valued logic.

Real controversies are of course more complicated than this imagined debate about the colour of oranges. However, mere increase in complexity does not imply modifications to logic. Rather, it seems that one central feature in adult mature ways of thinking is exactly the capacity to recognise logical space, i.e., the capacity to see that there are possible claims that are perhaps true, in situations of debates analogous to that about the colour of oranges. For instance, the question of whether light should be understood as waves or particles could be a similar case. Although in terms of logic both cannot be true at the same time, they might both be false analogously to the claim about oranges as yellow or red. A new perspective might be found that allows one to reconcile between the two interpretations and find a new, more accurate one. In general, recognising the possibility that two opposing views are not necessarily the only alternatives, i.e., that the alternatives in a certain debate can both be false, allows one to form a new, better informed view that is capable of integrating the essential elements from the earlier antithetical views.

The same applies to the concept of change. In the dialectical theories of human development, change is identified as a central feature of reality that dialectical thinking is claimed to reflect. The following simplified example shows why change as such does not require many-valued logic. Consider, for instance, an apple that is first green, then ripens and turns red. In a sense, this entails that the apple is both green and red, which are two conflicting properties that cannot belong to the apple at the same time but come to belong to it at different instances of time. However, recognising this does not influence the way in which we should analyse what logically follows from what. The apparent contradiction is solved simply by recognising that the two conflicting properties belong to the apple at different points of time. It might be a sign of the kind of attitude characteristic of youthful thinking to create a controversy about the colour of the apple on the basis of the evidence, sticking vigorously to the claim that the apple is either red or green. A more mature thinker, by contrast, would be prepared to accept that, at this moment, in this light and under these conditions the apple seems, say, green, but that this does not imply that it should permanently be so. It might change or there might be other lighting conditions in which it appears to be of a different colour.

One additional example can be introduced to illustrate the ways in which mature cognition is able to transcend simplified dichotomies. Sometimes debates are construed in a way that two views are opposed to each other and the impression is created that these views are, as the philosophical terminology puts it, exhaustive. Being exhaustive means that there are no alternatives to the views

that are presented. Many classical moral dilemmas are construed in this way. A standard example is the so-called 'trolley problem'. In the scenario, a trolley is approaching a rail switch between two tracks. On one track there are five people and on the other only one person. The scenario is that one must choose and guide the trolley on either of the two tracks, i.e., to choose between killing one or five people. Moral theories are often tested with respect to their capacity of offering solutions to these kinds of problems.[20] However, some philosophers have criticised these scenarios and suggested that in situations of a moral dilemma one should look for a third alternative.[21]

There is a structural similarity in these dilemmas to the above example about the debate of the colour of oranges. Both assume that two conflicting alternatives (i.e., such that they cannot be true at the same time) exhaust the space of (logical) possibilities. While in principle there could be a pragmatic restriction, the cases are such that there are always other *logical* possibilities. This means that although the orange cannot be yellow and red in the same respect and at the same time, or that one cannot navigate the trolley on two distinct tracks at the same time,[22] the alternatives do not exhaust what is possible from a logical point of view. Orange is a possible answer to the question about the colour of an orange and some moral philosophers argue that we should answer trolley problems in a similar way: look for a third alternative and do everything you can to stop the trolley, for example. There are no logical constraints that would narrow the options down to taking the orange being either yellow or red or having to choose between running over one or five persons. Unfortunately, logic does not prevent people from sometimes having to face tragic decisions between two or more terrible outcomes. However, such decisions are not a matter of logic, and adding truth-values to logic does not help in saving one from possibly tragic decision-making. It seems, however, that maturity of thought helps one in seeing beyond simplified dichotomies and recognising that there are more options than initially might appear.

Therefore, from the point of view of philosophical logic, there is one central difference between youthful and mature thought: It is the capacity to recognise which oppositions or conflicts are exhaustive and which are not. By contrast, on the basis of the psychological descriptions starting from Piaget's analysis and criticism to it, youthful thought tends to see all conflicts and oppositions as exhaustive. Often this means a tendency to confuse between contrary and contradictory opposites. Confusing between these two might thus lead one to assume that from one pair of contrary opposites the other pair logically follows. This is not the case because contrary opposites

can both be false. For example, if one maintains that the world is not good it does not follow that it is bad because both claims can be false at the same time. The world might be in essence neutral with respect to being good or bad. However, not all conflicting notions that youthful thought might assume to exhaust the logical space are contrary opposites. They might be like yellow and red in our example above. Those are conflicting notions in the sense that they cannot be true at the same time. However, they can be false, and thus it would be erroneous to assume that a debate between such notions is exhaustive, i.e., that there are no other alternatives. As we have suggested above, one crucial difference between youthful and mature ways of thinking could be that the latter can recognise which oppositions are which and whether some conflicting notions exhaust the logical space or not, while the former tends to see all conflicts as ones in which it is necessary to choose between two given options.

Epistemological Relativism and Integration

Should mature adult thinking as a psychological capacity be described as epistemological relativism, then? As mentioned, some descriptions (such as Kramer's, 1983) of mature cognition come rather close to descriptions of epistemological relativism in philosophy, and this is problematic. Relativism as such is a rather weak position. What is relative to what, why and in what sense? In general, epistemological relativism in philosophy allows that there can be contradictory belief systems, i.e., groups of statements, which can, despite being contradictory, be justified or even known.[23] However, in order to merit closer scrutiny, epistemological relativism must recognise that there are some non-relative standards with respect to which it can be assessed whether a belief system (let us call it S_2) is such that it should be accepted alongside another one (let us call it S_1) as true although some beliefs in S_2 contradict one or more belief in S_1.

This general viewpoint can be illustrated by an example. Let us imagine a biologist, who studies rabbits and hares. In her free time, she also writes fables for children with animals such as hares, foxes and bears as protagonists. The statements that constitute her biological studies about hares contradict some statements in her fables. For instance, although in her studies rabbits flee from foxes, in her fables they might face their fear, talk to the fox and be feisty rather than fearful. A form of epistemological relativism claiming that such an example leads to an alternative belief system, namely that of fables, which competes with the belief system of biological studies, is not a plausible one. A position that poses no restrictions to the standards used to evaluate which belief

systems be accepted as true although contradictory, would be absurd. One can imagine, for example, that the status of an alternative true belief would be ascribed to one so that, say, the third word of each sentence of the biologist's studies is written in reverse direction. It is obvious, however, that such a conversion does not have any credentials for truth.

With respect to the original example, it should be noted that one can of course claim that the fables convey some important truths about facing one's fears, for example, but this does not mean that such truths in the fables should be read literally and taken to *replace* or challenge the claims that the biologist makes in her scientific studies. Similarly, famous examples from seemingly contradictory claims between the *Genesis* and the theory of evolution (whether the human being was created on the sixth day of creation or developed from an ancient precedent of apes) is not typically taken to imply two different criteria for evaluating which of these accounts is true. It can rather be suggested that the *Genesis* is a myth or a creation story that as such does not undermine the truth or the epistemic justification or scientific evidence for the evolution theory.

A more important question with respect to epistemological relativism and adult cognition would be what kind of standards are used by mature cognitive agents to *evaluate* which belief systems to accept to have an equal claim to being true and which ones to reject. It is also important to stress that being a relativist about knowledge does not necessarily imply that one is aiming at a more comprehensive overview about things: an unrestricted relativism of an 'anything goes' type does not directly support the quest for improving one's own views, attitudes, and conceptions. If all views and collections of them are equally acceptable, why should one strive for any cognitive development? Such a quest for improvement rather requires standards that can be used to critically evaluate which views are sustainable and which ones are not as well as the assumption that one should aim at better and more accurate views in the way of the example of the colour of oranges: to find theories, general views, and notions that allow one to recognise merely apparent contradictions and proceed to form a more unified and complex view that can explain why certain simplified positions seem appealing.

However, it is important to stress that this as such is not epistemological relativism. The kind of respect for different viewpoints that is characteristic of the cognitive component of wisdom (Kallio,

2016; see Chapter 2), as described in today's psychological discussion, does not entail that, for instance, any claim someone holds would have equal status to any other in terms of epistemological justification. An important distinction in this context is the following: a cognitively mature person seems to accept that everyone is entitled to their opinions. However, this is quite different from taking any opinion as having an equal *epistemic* justification as any other. For instance, if someone says, 'human beings did not evolve from ape-like creatures because I never saw that happen' this person is merely disregarding the research and the scientific evidence for the theory of evolution and not offering evidence that would genuinely compete with the evidence that backs the theory. Similarly, it would make no sense to say that there are no acceptable epistemic criteria for solving a controversy about whether it is raining or not between two people one of whom is standing outside and perceiving the situation (saying that it is not raining) and another person who is inside with his ears blocked by headphones and eyes blinded by a blindfold (who is saying that it is raining simply because he feels like that). Therefore, although both of these people are entitled to their opinions, only one of them has access to such standards that can be taken as relevant, generally applicable criteria for epistemic justification.

Rather, it can be suggested that a mature adult way of thinking is characterised by integration as the term is used in developmental psychological studies. In order to illustrate what integration means, let us assume a situation in which there are different viewpoints concerning immigration in some groups of people. The types of opinions can be labelled as 'highly restrictive', 'moderately restrictive', 'moderately positive' and 'highly positive'. These views conflict and offer multiple perspectives to the same phenomenon: one is saying that immigration should be heavily restricted, another one that it should be moderately restricted, a third one that it should be moderately encouraged, and a fourth one that it should be strongly encouraged. Although it is questionable whether there is any absolute truth in such moral or political matters, the example can be used to illustrate a mature adult way of thinking in terms of integration. One of the reasons why it can do so is that the situation is emotionally complex.

According to Kallio (2011), integrative thinking is more than just adding pieces or opinions together. It would hardly make sense, let alone to exemplify mature thinking, to say that one must be everything from highly positive to highly restrictive with respect to immigration. Consequently, integration is not just a sum of things, as in dialectical thinking synthesis is not just a combination

or group of former-level thought objects. Integration of these viewpoints might for example mean to take all perspectives and their background emotions into account. For instance, the anger that is driving the highly restrictive view is seen to arise, for instance, from many people losing their jobs and creating the fear that they will not find new ones if more people enter the community. Integration thus understood does not mean that one accept everyone's views as true – as mentioned, there may not be one true position in these matters. Rather, integrative thinking grants that the person with views that one might reject oneself *is still accepted as a person* whose feelings are accepted and respected. Those views are therefore understood and integrated to the other views of participants of the group, and perhaps agreement can be reached on something, such as the importance of local values and work, while there is disagreement about other matters. Integration, therefore, can be taken to mean integration of intellect and emotion (see e.g. Labouvie-Vief, 1990, has explored this kind of integration process; see also Edmondson and Hülser, 2012).

Moreover, mature integrative thinking can also assume some general ethical standards or principles, such as non-violence and hence maintain that whatever one's view on immigration, for example, it should be peacefully expressed and defended. Therefore, a mature adult way of thinking is far removed from a view that takes all knowledge claims and ethical principles to be merely relative. Respecting others' feelings and other people as persons is central for integration as a mature adult way of thinking, and this does not mean taking all views to be true. Therefore, integration should not be identified with relativism in philosophical epistemology.

Living Without Certainty

How, then, should one describe mature adult cognition from a point of view of philosophical epistemology? What are the factors that allow one to respect other people's views and emotions even if one takes them to be mistaken or misplaced, and what kind of an attitude best supports the quest for improving one's own views? It is best to begin with identifying what does *not* support such an attitude. It seems that the psychological studies show that overt attachment to the truth of one's own views is not a characteristic of mature thinking. If one simply assumes oneself to be right or dogmatically takes some authority to be right, this of course does not inspire respect for other people's views. However, it is crucial to stress that unrestricted relativism by no means supports the inquiry and research, analysis and curiosity about other people's views that is necessary to mature beyond such a state. The example about the political debate that requires some general principles

(such as non-violence) also shows that integration should not be identified with unrestricted relativism.

This suggests that a mature adult attitude to one's own knowledge and cognition should rather be described as one in which one is not so certain about the truth of one's own beliefs and eager to compel others to accept them as well. However, this should be combined with the attitude of striving for reasonable views that incorporate a wealth of information and yet are open to the possibility that new, more accurate views can be found. Such new views might well transcend the conflicts and perhaps apparent contradictions that one might encounter in one's inquiries in a way resembling the example of the debate about the colour of oranges. In this way, one is not trapped by simplified dichotomies ('the orange has to be either yellow or red!') but is free to see the possibility of a more refined cognitive structure that goes beyond them ('oh, it is orange').

Although uncertainty, fallibilism and probabilism are prominently featured in contemporary epistemological discussion as well, one way to analyse adult mature cognition from the point of view of philosophical epistemology would be to look how it resembles theories in these trends of philosophical epistemology. However, in order to avoid technicalities and to connect the discussion to themes about how one should live and act, as in the examples about integration, a mature adult way of thinking can briefly be compared to ancient Pyrrhonian skepticism, for which Sextus Empiricus (trans. 2000) is the best source.[24] In the following, we shall consider such skepticism to see if we can elicit some similarities to a mature adult way of thinking in developmental psychology.

A general guideline for a Pyrrhonian skeptic is to investigate (Greek *skepsis* means 'study', 'investigation', 'scrutiny') how things seem to be and even to argue as best one can about them and compare arguments presented for competing views. However, a Pyrrhonian skeptic claims to live by appearances, which means not being attached to a specific, unchangeable view about how things are. This means that a Pyrrhonian skeptic can very well take something to be the case: if I am a Pyrrhonian skeptic, I can take it to be the case that the soup offered to me now is hot because it seems to me to be so. If I turn the shower on and the warm water has been cut for the day, I can take it to be the case that the water is cold because it seems to me to be so. However, such a skeptic

suspends judgment with respect to whether this is the stable nature of things and avoids statements like 'the soup is by nature hot', 'water is by nature cold'. Compared to the temperatures measured on the surface of the sun, my soup is not hot at all, and for a polar bear (or even to a Finn who swims in Finnish lakes in the summer) my shower would be quite warm. However, this is not epistemological relativism: the claims are compatible with it being true that the soup has a certain measured or measurable temperature (say +55°C) and that the water in my shower has one as well (say, +30°C), and that there are some standards of how to measure the temperature and so on that apply to all the cases. Yet, this does not imply claims like 'soup is by nature hot and feels hot to all observers in all circumstances' or 'water is by nature cold and feels cold to all observers'.

Living by appearances, i.e., living on the basis of how things seem to be, Sextus Empiricus (trans. 2000) claims, gives the Pyrrhonian skeptic the space to welcome new appearances – 'now things seem different' – without disturbances in the tranquil state of the skeptic's mind. He also claims that such an attitude is necessary to maintain tranquillity through long periods of time.

It is important to stress that even the Pyrrhonian skeptic is committed to searching for the truth. If we suppose that the truth cannot be found, or that there are all kinds of undefinable standards for what knowledge is, such an attitude does not inspire us to cultivate our understanding of the world. Yet the kind of attitude that can be found in a Pyrrhonian skeptic underlines that cognitive maturity is not equivalent of being knowledgeable about particular facts. Although there is nothing wrong with remembering facts, maturity rather seems to be associated with a comprehensive viewpoint that allows one to see how different things go together. This also constitutes an important difference between cognitive maturity as described in modern cognitive developmental psychology and Pyrrhonian skepticism. Although committed to inquiry (*skepsis*) into how things are, Pyrrhonian skepticism is not especially focused on the quest for understanding comprehensive wholes.

Conclusions

We have argued that philosophical conceptual analysis can be used to clarify the results of empirical research, especially when it pertains to topics such as thinking, contradiction and knowledge. Unfortunately, conceptual analysis is not often included in the methodological toolbox

of the empirical sciences, unless one adds to them studies in philosophy. As our argument shows, lack of theoretical precision can lead to confusion in the use of terms. At its best, conceptual analysis can give insight into which concepts to use, how they are defined, what kind of limits there are in using them and what kind of boundaries their usages have.[25]

One conceptual tool we have used to clarify how a mature adult way of thinking differs from youthful thinking distinguished in empirical psychological studies is the distinction between contrary and contradictory opposition. Using this distinction, we have shown that rather than a difference between two-valued and many-valued logic, the difference between mature and youthful ways of thinking should be described in terms of a *developing capacity to distinguish between different kinds of conflicts and oppositions.* In Piaget's studies, different conflicts and oppositions are often confused. We have argued that a mature adult way of thinking can be characterised by its capacity to recognise conflicts that allow other alternatives, as is the case between contrary opposites and other conflicts that are not logically exhaustive. For instance, while a youthful way of thinking might take contrary opposites (e.g., between black and white) to be the only alternatives, adult mature thinking recognises that we do not need to choose between black and white (when debating about the colour of an object). The object might be grey or of a different colour altogether. While neo-Piagetians seem to detect the possibility of transcending simplified Piagetian dichotomies in what is called 'dialectical thinking', they do not use the philosophical conceptual tools we have used here to explain what dialectical thinking consists in. More analysis would be needed to articulate how this finding can be used to clarify the theories of adult cognitive development.

We have also argued that it is important to differentiate two approaches to epistemology: philosophical (*PhilEp*) and psychological (*PsyEp*) ones. While philosophical epistemology typically contains a normative element and analyses the necessary and sufficient conditions for knowledge (and how the concept of knowledge should be used), psychological epistemology concerns the ways in which subjects describe their own cognition. This means that the results of psychological epistemology are, from the point of view of philosophical epistemology, results about what the studied subjects believe, i.e., take to be the case. As has been argued above, this differs from philosophical epistemology recognising that belief does not imply truth. In brief, we have pointed out that the notions of philosophical epistemology can be used to clarify what adult mature

cognition and way of thinking is like. To avoid confusion, we have moved away from the notions of psychological epistemology and suggested an analysis of mature adult ways of thinking in terms of integration.

As we have seen above, integration differs from epistemological relativism, since it does not require that one assumes different standards of truth for different views. We have illustrated this by the example of conflicting views about immigration. A mature adult way of thinking does not require that one takes all the different views to be true. However, a mature way of approaching such a conflict is one in which the emotions related to the views are recognised and respected and in this sense integrated. Therefore, integration is not a conglomeration of various conflicting views but, rather, characterised by recognising that everyone is entitled to their view, the emotions related to them and that they should be respected as persons with views that conflict with one's own. This differs from a youthful approach that would simplify such a complex situation into a debate about who is right and who is wrong and perhaps even assuming that not only the views but also the emotions of the others are misplaced and should be changed.

Finally, we raised the question if we can find an example of an attitude to knowledge that resembles the one identified as characteristic of a mature adult way of thinking. One example that we have detected is found in Ancient Skepticism and its Pyrrhonian variant. Historical comparisons are common in adult developmental literature (e.g., in the accounts of dialectical thinking referring to Hegel). However, such comparisons are in danger of being misleading if they are made outside the study of the history of philosophy, since the concepts that are used in developmental psychology differ to such a great extent from those of philosophy. We have also suggested that while there are similarities between Ancient Pyrrhonian Skepticism and a mature adult way of thinking, the two differ as well, especially with respect to what extent one strives for a comprehensive view about how things are.

Since adult mature ways of thinking are seen as a part of wisdom in current empirical wisdom studies, we would expect that our analysis could be used to fuel new discussion in wisdom studies as well. What is exactly meant as scholars refer to "relativism" and "relativistic-dialectical thinking" as part of the wisdom? We have suggested that we should rather talk about integrative

processes to avoid confusion. However, we stay open to any new discussions, with possible counter-arguments to our claims.

References

Aristotle. (1984). *The complete works of Aristotle* (J. Barnes, Ed.) (Bollingen series 71, 2, Vols. 1–2). Princeton, NJ: Princeton University Press. (Original work published ca. 384–322 BCE/1984)

Baggini, J., & Fosl, P. S. (2010). *The philosopher's toolkit: A compendium of philosophical concepts and methods* (2nd ed.). Malden, MA: Wiley-Blackwell.

Baltes, P. B., & Staudinger, U. M. (2000). Wisdom: A metaheuristic (pragmatic) to orchestrate mind and virtue toward excellence. *American Psychologist*, *55*(1), 122–136.

Basseches, M. (1984). *Dialectical thinking and adult development* (Publications for the advancement of theory and history in psychology No. 3). Norwood, NJ: Ablex.

Basseches, M. (2005). The development of dialectical thinking as an approach to integration. *Integral review*, *1*(Jun), 47–63. Retrieved from https://integral-review.org/the-development-of-dialectical-thinking-as-an-approach-to-integration/

Baxter Magolda, M. B. (2004). Evolution of a constructivist conceptualization of epistemological reflection. *Educational Psychologist*, *39*(1), 31–42.

Bluck, S, & Glück, J. (2004). Making things better and learning a lesson: Experiencing wisdom across the lifespan. *Journal of Personality*, *72*(3), 543–572.

Cavanaugh, J. C., & Blanchard-Fields, F. (2014). *Adult development and aging* (7th ed.). Belmont, CA: Cengage Learning.

Chandler, M., Boyes, M., & Ball, L. (1990). Relativism and stations of epistemic doubt. *Journal of Experimental Child Psychology*, *50*(3), 370–395.

Curnow, T. (1999). *Wisdom, intuition and ethics* (Avebury series in philosophy). Aldershot, England: Ashgate.

Edmondson, R. (2015). *Ageing, insight and wisdom: Meaning and practice across the lifecourse*. Bristol, England: Policy Press.

Edmondson, R., & Hülser, K. (2012). Introduction: Integrated practical reasoning. In R. Edmondson & K. Hülser (Eds.), *Politics of practical reasoning: Integrating action, discourse and argument* (pp. 1–14). Lanham, MD: Lexington Books.

Greene, J. A., Azevedo, R., & Torney-Purta, J. (2008). Modeling epistemic and ontological cognition: Philosophical perspectives and methodological directions. *Educational Psychologist*, *43*(3), 142–160.

Grossmann, I. (2017). Wisdom in context. *Perspectives on Psychological Science, 12*(2), 233–257.

Hendricks, V., & Symons, J. (2015). Epistemic logic. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Fall 2015 ed.). Retrieved from https://plato.stanford.edu/archives/fall2015/entries/logic-epistemic/

Hoare, C. (Ed.). (2011). *The Oxford handbook of reciprocal adult development and learning.* New York, NY: Oxford University Press.

Hofer, B. K., & Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research*, *67*(1), 88–140.

Hursthouse, R. (1995). Fallacies and moral dilemmas. *Argumentation, 9*(4), 617–632.

Inhelder, B., & Piaget, J. (1958). *The growth of logical thinking: From childhood to adolescence: An essay on the construction of formal operational structures*. London, England: Routledge & Kegan Paul.

Kallio, E. (2001). Reflections on the modern mass university and the question of the autonomy of thinking. In J. Välimaa (Ed.), *Finnish higher education in transition: Perspectives on massification and globalisation* (pp. 73–90). Jyväskylä, Finland: University of Jyväskylä, Institute for Educational research.

Kallio, E. (2011). Integrative thinking is the key: An evaluation of current research into the development of adult thinking. *Theory & Psychology, 21*(6), 785–801.

Kallio, E. (2015). From causal thinking to wisdom and spirituality: Some perspectives on a growing research field in adult (cognitive) development. *Approaching Religion, 5*(2), 27–41. doi:10.30664/ar67572

Kallio, E. (2016). *Ajattelun kehitys aikuisuudessa: Kohti moninäkökulmaisuutta*. [The development of thinking in adulthood: Towards multiperspective thinking] (Research in Educational Sciences No. 71). Helsinki, Finland: The Finnish Educational Research Association.

Kamm, F. M. (2016). *The trolley problem mysteries* (E. Rakowski (Ed.), Berkeley Tanner lectures). New York, NY: Oxford University Press.

King, P. M., & Kitchener, K. S. (2004). Reflective judgment: Theory and research on the development of epistemic assumptions through adulthood. *Educational Psychologist*, *39*(1), 5–18.

Kramer, D. A. (1983). Post-formal operations? A need for further conceptualization. *Human Development, 26*(2), 91–105.

Kuhn, D., & Weinstock, M. (2002). *What is epistemological thinking and why does it matter?* In B. K. Hofer & P. R. Pintrich (Eds.), Personal epistemology: The psychology of beliefs about knowledge and knowing (pp. 121–144). Mahwah, NJ: Erlbaum.

Labouvie-Vief, G. (1990). Wisdom as integrated thought: Historical and developmental perspectives. In R. J. Sternberg (Ed.), *Wisdom: Its nature, origins, and development* (pp. 52–84). Cambridge, England: Cambridge University Press.

Leadbeater, B. (1986). The resolution of relativism in adult thinking: Subjective, objective, or conceptual? *Human Development, 29*(5), 291–300.

Perry, W. G. Jr. (1970). *Forms of intellectual and ethical development in the college years: A scheme*. New York, NY: Holt, Rinehart and Winston.

Piaget, J. (1976). Piaget's theory. In B. Inhelder, H. H. Chipman, & C. Zwingmann (Eds.), *Piaget and his school: A reader in developmental psychology* (pp. 11–23). New York, NY: Springer-Verlag.

Pillow, B. H. (1999). Epistemological development in adolescence and adulthood: A multidimensional framework. *Genetic, Social and General Psychology Monographs, 125*(4), 413–432.

Plato. (1997). *Plato: Complete works* (J. M. Cooper & D. Hutchinson, Eds.). Indianapolis, IN: Hackett. (Original work published ca. 428/427–348/347 BCE/1997)

Redding, P. (2018). Georg Wilhelm Friedrich Hegel. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Summer 2018 ed.). Retrieved from https://plato.stanford.edu/archives/sum2018/entries/hegel/

Riegel, K. F. (1973). Dialectic operations: The final period of cognitive development. *Human Development*, *16*(5), 346–370.

Riegel, K. F. (1976). The dialectics of human development. *American Psychologist, 31*(10), 689–700.

Schommer-Aikins, M. (2004). Explaining the epistemological belief system: Introducing the embedded systemic model and coordinated research approach. *Educational Psychologist*, *39*(1), 19P29.

Seltman, M., & Seltman, P. (1985). *Piaget's logic: A critique of genetic epistemology*. London, England: Allen & Unwin.

Sextus Empiricus. (2000). *Outlines of scepticism* (J. Annas & J. Barnes, Eds.) (Cambridge texts in the history of philosophy). Cambridge, England: Cambridge University Press. (Original work published ca. 3rd century)

Sorensen, R. (2016). Vagueness. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Winter 2016 ed.). Retrieved from https://plato.stanford.edu/archives/win2016/entries/vagueness/

Spencer-Rodgers, J., & Peng, K. (Eds.). (2018). *The psychological and cultural foundations of East Asian cognition: contradiction, change, and holism*. New York, NY: Oxford University Press.

Steinberger, F. (2017). The normative status of logic. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Spring 2017 ed.). Retrieved from https://plato.stanford.edu/archives/spr2017/entries/logic-normative/

Steup, M. (2005). Epistemology. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Summer 2018 ed.). Retrieved from https://plato.stanford.edu/archives/sum2018/entries/epistemology/

Swoyer, C. (2003). Relativism. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Spring 2009 ed.). Retrieved from https://stanford.library.sydney.edu.au/archives/spr2009/entries/relativism/

Tuominen, M. (2016). Aikuisen ajattelua koskeva käsitteistö: filosofista tarkastelua [On concepts concerning adult thinking: philosophical reflections]. In E. Kallio (Ed.), *Ajattelun kehitys aikuisuudessa: Kohti moninäkökulmaisuutta* [The development of thinking in adulthood: Towards multiperspective thinking] (Research in Educational Sciences No. 71, pp. 355–379). Helsinki, Finland: The Finnish Educational Research Association.

Trowbridge, R. H. (2011). Waiting for *Sophia*: 30 years of conceptualizing wisdom in empirical psychology. *Research in Human Development, 8*(2), 149–164.

Trowbridge, R. H., & Ferrari, M. (2011). *Sophia* and *Phronesis* in psychology, philosophy, and traditional wisdom. *Research in Human Development*, *8*(2), 89–94.

---

[1] An earlier and more limited version of some arguments made in this chapter is found in Tuominen (2016).

[2] Other scholars have also called for conceptual clarity; see, e.g., Leadbeater (1986). Leadbeater's analysis, however, remains in the cognitive psychological framework and does not make use of the tools of philosophical conceptual analysis. It is exactly the philosophical analysis that we argue helps to clarify the central issues involved in the discussion. Pillow (1999) moves at the limit of philosophical and psychological analysis but, in the end, uses the central concepts in psychological rather than philosophical sense.

[3] In this article, philosophical epistemology refers to the distinct field of philosophy that as such developed in the course of the 20th century and that uses the notions of belief, epistemological justification and truth. There is of course a long history of discussions about knowledge in rather different terms in the history of Western philosophy taking ancient Greek philosophy as its starting point, not to mention the philosophical traditions outside it. We focus on this kind of an epistemology because the relevant cognitive psychological discussion uses its central notions, although in a rather different way as we shall see in the body text.

[4] In brief, a dichotomy means a (possibly hierarchical) opposition of two alternatives: male/ female, good/bad. Dichotomies often give the false impression that they offer an exhaustive classification of a logical field. For instance, males and females do not exhaust the class of gendered beings, even within the human species, and good or bad do not exhaust the realm of such things, actions, or properties that can be evaluated; also neutral actions are possible.

[5] To an extent, Pillow's discussion of postskeptical rationality (1999, p. 421) resembles such an attitude. However, on the whole his analysis is formulated in terms of psychological rather than philosophical epistemology.

[6] *On interpretation* 7, 17b16-26; see Aristotle (trans. 1984). Aristotle's original formulation has been revised later because modern logic interprets the relationship between 'all' and 'some' in a different way. The distinction between contrary and contradictory opposition remains, however.

[7] It must be reminded already in this stage of the article that according to other empirical studies it is not so clear that youngsters are incapable to relativistic thinking (Chandler, Boyes, & Ball, 1990; Greene, Azevedo, & Torney-Purta, 2008). It seems merely that youth is an age of epistemic questioning and doubt, not purely absolutism. Thus it may be incorrect to state that relativistic-dialectical thinking is a form of mature adult cognition solely. It might be supposed that cognition under study may involve a life-span development trend, as Riegel (1973) and Basseches (1984) have suggested. Also in the study of wisdom it is currently known that wise thinking and action emerge already in the late youth, not solely in old age as was first assumed (e.g. Bluck & Glück, 2004).

[8] The details of these conditions are of course debated. The focus here is not to particulate a specific epistemological theory but to outline the central notions of the discussion. For a general introduction to 20th century philosophical epistemology, see Steup (2005).

[9] See also, e.g., Hendricks and Symons (2015): "a belief is not necessarily true". The same principle also applies in epistemic logic where from '*a* believes that *p*', it is not possible to infer the truth of *p*.

[10] For Plato, see, e.g., *Republic* 511b, in Plato (trans. 1997); for Aristotle, see *Topics* 100a22, (trans. 1984), vol. 1. In classical Greek *dialagesthai* means simply 'to discuss'.

[11] However, Riegel's claim is possibly limited. Piaget's theory of development of thinking is constructivist theory, i.e. knowledge-formation is in constant process (Piaget, 1971). There is continuous dynamic movement between mental structures and change. If this is the same what is meant with dialectical thinking in the meaning post-Piagetian scholars use it, it is out of the scope of this article.
[12] It seems that Riegel does not discuss the situation where the connection of views is non-contradictory, i.e. there is no disagreement between separate views or statements: The relationship between different things can also be complementary.
[13] Plato and Aristotle use the Greek expression *pros ti* with respect to or in relation to something. In the translations of Aristotle's *Categories*, the term is typically translated as 'relative' (see, e.g., *Categories* 4, 1b26; tr. Ackrill in Aristotle (trans. 1984), vol. 1. For Plato, see, e.g., *Theaetetus* 160b (trans. 1997).
[14] For Piaget's binary logic and its unclarity with respect to whether one is talking about logic as a theory of valid inference or thought processes in individuals, see, e.g., Seltman and Seltman (1985, 220). For a similar conception of logic as problem-solving, see also Chandler, Boyes, and Ball (1990).
[15] On the question to what extent logical validity should govern human modes of thinking, see, e.g., Steinberger (2017).
[16] It is noteworthy that knowledge is a relative for Aristotle as well (*Categories* 7, 6b3); see (trans. 1984), vol. 1.
[17] There is a distinct philosophical problem called 'vagueness' that is related to the question of whether human notions have clear boundaries or not. Borderline cases such as very light drizzle might be taken to imply raining and not-raining at the same time. However, this is a different question, and it is debated whether vagueness entails more truth-values for logic. On vagueness, see, e.g., Sorensen (2016). In any case, no one assumes that mature cognition implies knowing the boundaries for all notions. Rather, it should be described as recognising that we do not necessarily know where the boundary between raining and not-raining goes. A person with that kind of an attitude can also respect other views that draw the boundary between raining and not-raining in a different way.
[18] See Redding (2018), section 3.1.2 *Science of Logic*.
[19] In this example, it is assumed, for the sake of simplicity, that oranges are orange. Let us also assume that colour concepts in that community have clear boundaries. This assumption is made to clarify that the example does not concern vagueness also referred to above in note 5, i.e., the question of where the boundaries of qualities such as yellow and red must be drawn and whether they have any.
[20] For trolley problems, see Kamm (2016).
[21] E.g., Hursthouse (1995).
[22] It is also worth noting that, in neither case, the logically contradictory alternative (orange being yellow and red; navigating the trolley on two tracks at the same time) is not a solution to the problem. Therefore, enlarging the scope of logic does not really solve the problems involved. Moreover, as the body text shows, there is no need to look for more logical space outside two-valued logic. Quite the contrary, as the body text makes clear, two valued logic contains enough space (i.e., logical possibilities) to solve the problems.
[23] For types of philosophical relativism, see Swoyer (2003).
[24] See especially his work known with the title *Outlines of Pyrrhonism*.
[25] For a basic collection of philosophical tools, see, e.g., Baggini and Fosl (2010).