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Abstract: By taking an argument to consist of one premise and one conclusion, the Periodic Table of Arguments (PTA) excludes from its conceptualization the element traditionally called the 'connecting premise' or 'warrant' – which is often missing from the discourse. This paper answers the question of how to evaluate the underlying mechanism of an argument by presenting a method for formulating its 'argumentative lever' based on an identification of its type.

Keywords: argument evaluation, argument scheme, connecting premise, missing premise, Periodic Table of Arguments, warrant

1. Introduction

The Periodic Table of Arguments (PTA) is a recently developed categorization of argument that integrates the existing dialectical and rhetorical accounts of argument schemes, fallacies, and other means of persuasion into a systematic and comprehensive whole (Wagemans 2016, 2019). Like any overview of argument types, the PTA can, in principle, be used to develop methods for the production, the analysis, and the evaluation of argumentative discourse. So far, it has primarily been used for analytical purposes.[1]

Different from many other approaches, the PTA takes an argument to consist of one conclusion and one premise. In doing so, it excludes what is traditionally called the 'connecting premise' or 'missing premise' from being conceptualized as an integrating part of an argument. One reason for doing that is to avoid an infinite regress problem: if the link between the premise and the conclusion is added to the argument as a premise, the link between that linking premise and the conclusion should also be added as a premise, ad infinitum (see Wagemans 2014, pp. 15-17).

Another, perhaps even more important reason for working with this minimal conceptualization of argument is to dissuade the analyst of argumentative discourse from projecting into the discourse all kinds of preconceived ideas about what an argument should consist of to be 'correct', 'valid', or 'complete' in any sense of the term. For such projection, if not accounted for by explicit methodological considerations, invites the analyst to the hermeneutic activity of 'hineininterpretieren'. This is problematic because any crossing of the border between providing a theoretically informed description and giving a subjective reconstruction of the original discourse may interfere with the subsequent assessment of the argument under scrutiny.

After having given a theoretical and a practical reason for why the PTA takes an argument to consist of one conclusion and one premise, I would like to briefly indicate the consequences of this choice for applying the categorization for analytical purposes. I will do

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[1] The argument categorization framework of the PTA has been integrated into the linguistic representation framework of Constructive Adpositional Grammars (CxAdGrams) (Gobbo and Wagemans 2019a, 2019b, 2019c; Gobbo, Benini and Wagemans 2019) and it has been used for annotating argument schemes in natural discourse (Visser and Wagemans 2018; Visser et al. 2018, 2019, 2020).

so by contrasting its method for identifying arguments in natural discourse with the traditional method for doing so.

Existing classifications of arguments developed within the field of argumentation theory usually consist of a list of argument schemes, each of which has a predefined set of characteristics.[2] To determine the type of an argument found in natural discourse, this set of characteristics is used as an ideal model. The identification of the natural argument takes place by comparing the ideal to the real, and in case discrepancies are found, by subsequently using the ideal to reconstruct the real. In other words, the analyst uses the list of predefined argument schemes to find what should have been expressed in the original discourse but for unconscious, habitual, or strategic reasons has been expressed differently or remained completely absent from the discourse and to "repair" or "reconstruct" it accordingly.

This traditional method raises several problems, which I will illustrate by imagining a predefined argument scheme that consists of one conclusion and three premises – see Figure 1 – and an analyst who, in trying to match the elements of the scheme with the text under scrutiny, found the conclusion and premise 2 in the original discourse, but was not able to detect premise 1 in the original discourse (?) and found something that could be interpreted as an instantiation of premise 3 but was formulated in a slightly different way (premise 3').

predefined argument scheme	*original discourse*
conclusion	conclusion
premise 1	?
premise 2	premise 2
premise 3	premise 3'

Figure 1.   Abstract example of discrepancies between the ideal and the real

Should the analyst now add an instantiation of premise 1 as a missing premise to the original discourse and correct the formulation of premise 3' so as to achieve conformity with premise 3? How to justify such reconstruction? Which hermeneutic considerations or interpretation rules allow the analyst to transform the original discourse to have it correspond with the predefined set of characteristics of the argument scheme from the list? And how to choose which of the argument schemes mentioned on the list is the most fitting one in the first place? How many discrepancies are allowed for the analyst to conclude that the identification of the argument type is still the right one? And even if there is only a minor discrepancy, why wouldn't it be just another type of argument, one that is not yet mentioned in the list?

These questions all point to the same problem of the traditional method of identifying argument types, namely that it is based on a comparison between the ideal and the real. There is a list of predefined types of argument and it is left to the analyst to compare the items on the list to the argument in the original discourse. On the basis of mostly implicit criteria for correspondence or similarity, the analyst then takes a subjective decision regarding the identification of the argument type.

Different from such *comparative* approaches, the PTA takes a *procedural* approach to argument type identification and evaluation. This means that there are explicit instructions as to when, how and why the analyst should transform the original discourse. But it also means that there are no 'missing premises' that have to be added to the discourse only to comply with the arbitrary characteristics of some predefined argument scheme. This applies a fortiori to the 'connecting premise' that is meant to express the connection between premise and conclusion, for that would not only give rise to the problems about the justification of the

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[2] See, e.g., Perelman and Olbrechts-Tyteca (1969), Hastings (1962), Schellens (1985), Kienpointner (1992), van Eemeren and Grootendorst (1992), and Walton, Reed and Macagno (2008).

argument type identification just described but also to the infinite regress problem described earlier.

Taking an argument to consist of one conclusion and one premise, however, also raises an important question. If the PTA excludes what is traditionally called the 'connecting premise' or 'missing premise' from its conceptualization of argument, how can the categorization be used to evaluate the quality of the connection between premise and conclusion? In this paper, I aim to answer that question by explaining how to derive the so-called argumentative 'lever' (Wagemans 2019, p. 61) from the identification of the type of argument in terms of the theoretical framework of the PTA.[3]

The paper is structured as follows. First, I expound the relevant aspects of the theoretical framework of the PTA, focusing on the role of the notions 'argument form' and 'argument substance' in the description of the characteristics of the types of argument (Section 2). Next, I explain how the analyst can use the Argument Type Identification Procedure (ATIP) to formulate the argumentative lever based on an identification of the type of argument under scrutiny (Section 3). Then, I illustrate through an example how the analyst can use such a formulation of the lever to evaluate the quality of the connection between the premise and the conclusion of the argument (Section 4). Finally, I summarize the most important findings and indicate directions for further research (Section 5).

2. Characteristics of natural arguments

When viewed from a purely linguistic perspective, an analyst who found an argument in a text has found two statements and – on a lucky day – a connector. As soon as they label one of the statements as the 'conclusion' and the other as the 'premise', the perspective has already shifted from linguistics to pragmatics. For labelling statements with their argumentative function means to assume that one statement is doubted and the other is more certain in the eyes of an addressee, as well as taking the latter statement to be put forward by the arguer to establish or increase the acceptability of the former. These pragmatic insights are reflected in a wide range of descriptions of argument varying from Quintilian's classical rhetorical definition of an argument as 'the reason that, through things that are certain, provides credibility to that what is dubious (*ratio per ea, quae certa sunt, fidem dubiis adferens*) (*Institutio oratoria* 5, 10, 8 and 20)' to van Eemeren and Grootendorst's observation that the arguer 'acts on the assumption that others either doubt or might doubt the acceptability of his standpoint' and therefore that 'the purpose of his discourse is to convince someone else of the acceptability of his standpoint' (1992, p. 14).[4]
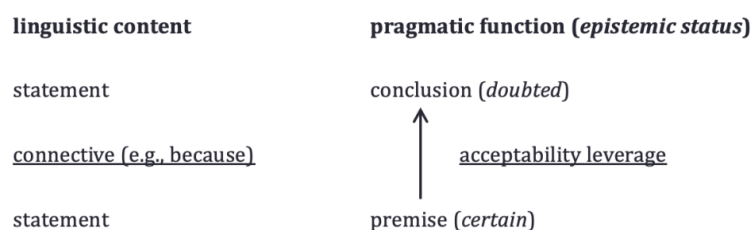

linguistic content	pragmatic function (*epistemic status*)
statement	conclusion (*doubted*)
connective (e.g., because)	acceptability leverage
statement	premise (*certain*)

Figure 2.   An argument viewed from a linguistic and pragmatic perspective

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[3] The paper partly builds on insights developed during the PTA-based specification of the 'initial analysis' and 'reasoning' parts of the Comprehensive Assessment Procedure for Natural Argumentation (CAPNA) (Hinton and Wagemans, forthcoming) as well as the proposal for extending the practice of 'fact-checking' in the direction of 'rhetoric-checking' (Plug and Wagemans, forthcoming). I would like to express my gratitude to Martin Hinton and José Plug for their valuable input and criticisms during these research collaborations.

[4] For a short survey of classical and contemporary definitions of argument see Wagemans (2019, pp. 58-60).

Apparently, and this is also clear from the above general definition of argument, the analyst is only justified in calling a combination of statements an 'argument' and attributing the labels of 'conclusion' and 'premise' to these statements if it can be shown that there is some kind of leverage of acceptability going on from the premise to the conclusion. Now the big question to answer here is the following: "How does this leverage of acceptability take place?" How is it possible that the arguer, as soon as they assume the addressee to have some doubt concerning the acceptability of a particular statement, can provide another statement that makes the addressee accept the former? What is the underlying mechanism at work here?

Within the theoretical framework of the PTA, this question is answered by hypothesizing the so-called 'law of the common term'. This law states that the premise, in order to fulfil its pragmatic aim of rendering the conclusion (more) acceptable, should share exactly one common term with the conclusion. Expressed in mechanistic metaphoric, this common term functions as the 'fulcrum' of the leverage of acceptability taking place within the argument.

Assuming that a statement consists of a subject and a predicate, the law of the common term yields two basic possibilities of argument forms. If the statements share the same linguistic subject, the argument has the form '*a* is *X*, because *a* is *Y*' and is characterized as a 'predicate argument' (abbreviated as 'pre'). In this case, the subject (*a*) functions as the fulcrum of the argument. A concrete example is *Unauthorized downloading* (*a*) *is not theft* (*X*), *because unauthorized downloading* (*a*) *does not deprive the original owner of the use of an object* (*Y*), which has *unauthorized downloading* (*a*) as its fulcrum.

The other basic possibility is when the common term is the predicate, which means the argument has the form '*a* is *X*, because *b* is *X*'. In this case, the predicate (*X*) is the fulcrum. Within the framework of the PTA, such arguments are called 'subject arguments' (abbreviated as 'sub'). An example is *Cycling on the grass* (*a*) *is prohibited* (*X*), *because walking on the grass* (*b*) *is prohibited* (*X*), which has *is prohibited* (X) as its fulcrum.

In natural argumentative discourse, any statement can be expressed as a proposition or as an assertion. The difference between the two modes of expression is that in the latter, the arguer's doxastic attitude regarding the statement is explicitly present in the discourse. The statement *The president is doing a great job*, for example, is expressed as a proposition, while the statement *I believe that the president is doing a great job* is expressed as an assertion. While both statements contain the proposition *the president is doing a great job*, the assertion additionally contains the doxastic attitude marker *I believe that* (see Figure 3).
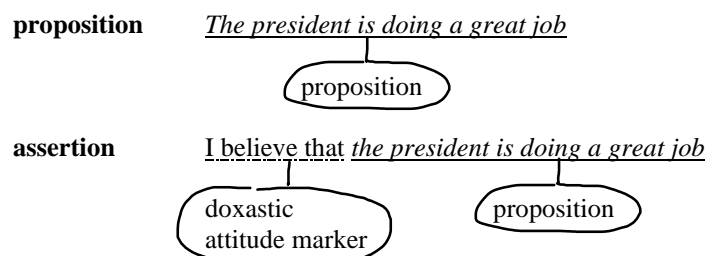

Figure 3.   The same statement expressed as a proposition and as an assertion

Within the theoretical framework of the PTA, the distinction between propositions and assertions is used to characterize arguments as 'first-order arguments' (abbreviated as '1') or 'second-order arguments' (abbreviated as '2'). If the propositions of the statements share a common subject or predicate, as in the examples above, the argument is characterized as a 'first-order predicate argument' ('1 pre') or 'first-order subject argument' ('1 sub')

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respectively. If the statements have the proposition of the conclusion as their common term, the argument has the form 'q is T, because q is Z', with 'T' standing for 'true', a standard formulation of the doxastic attitude marker that may or may not have been expressed in the actual discourse and can be added or substituted by the analyst. Such a 'second-order predicate argument' ('2 pre') has the shared proposition (q) as its fulcrum. An example is *We only use 10% of our brain* (q) *is true* (T)*, because we only use 10% of our brain* (q) *is said by Einstein* (Z)*, which has *we only use 10% of our brain* (q) as its fulcrum. And finally, if the statements contain entirely different propositions, they have the doxastic attitude marker as their common element. Such arguments are called 'second-order subject arguments' ('2 sub') and have the form 'q is T, because r is T'. An example is *He must have gone to the pub* (q) *is true* (T)*, because the interview is cancelled* (r) *is true* (T)*, which has 'is true' (T) as its fulcrum.

To summarize, the PTA in describing the characteristics of natural argument distinguishes between predicate and subject arguments as well as between first-order and second-order arguments. These characteristics are taken together in the notion of 'argument form', of which there are four. In the visualization of the PTA, arguments that share the same form are situated in the same quadrant, as pictured in Figure 4.

β (1 sub)   α (1 pre)

a is X, because b is X a is X, because a is Y

q is T, because r is T q is T, because q is Z
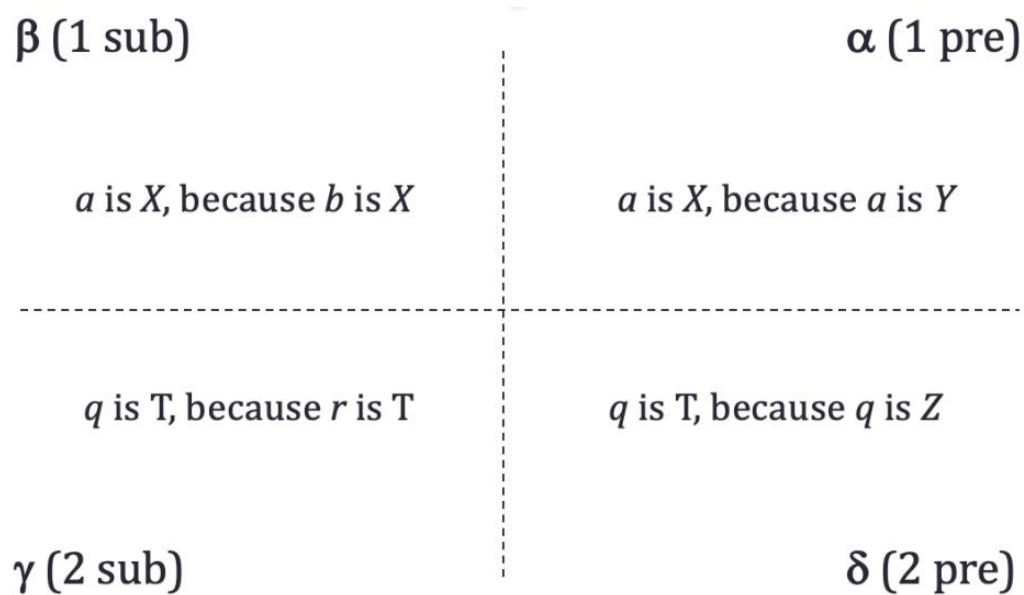
γ (2 sub)   δ (2 pre)

Figure 4.   The four quadrants of the PTA reflect the four basic argument forms

The third characteristic of arguments that constitutes the theoretical framework of the PTA is the so-called 'argument substance', i.e., the specific combination of types of statements. This characteristic is determined on the basis of a widely used typology of statements that is developed in debate theory and distinguishes between statements of fact (F), statements of value (V), and statements of policy (P). An argument can thus be said to substantiate one of nine possible different combinations of types of statements, conventionally starting with the type of statement expressed in the conclusion followed by that in the premise: PP, PV, PF, VP, VV, VF, FP, FV, FF. *The government should invest in jobs, because this will lead to economic growth*, for instance, can be characterized as a PF argument, since it combines a statement of policy (P) in its conclusion with a statement of fact (F) in its premise.

As is clear from this exposition, the analyst, in order to identify the type of any natural argument under scrutiny in terms of the PTA, should classify it in terms of the three constituents of its theoretical framework, namely as (1) a first-order or second-order

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argument; (2) a predicate or subject argument; and (3) as one out of nine possible combinations of types of statements. The superposition of these three partial characterizations yields what is called the 'systematic name' of the argument. To illustrate this notion, Table 1 provides the systematic names of the examples of arguments discussed above.

example	argument form	argument substance	systematic name
Unauthorized downloading (a) is not theft (X) (V), because unauthorized downloading (a) does not deprive the original owner of the use of an object (Y) (F)	a is X, because a is Y	VF	1 pre VF
Cycling on the grass (a) is prohibited (X), because walking on the grass (b) is prohibited (X)	a is X, because b is X	VV	1 sub VV
He must have gone to the pub (q) is true (T), because the interview is cancelled (r) is true (T)	q is T, because r is T	VV	2 sub VV
We only use 10% of our brain (q) is true (T), because we only use 10% of our brain (q) is said by Einstein (Z)	q is T, because q is Z	VF	2 pre VF

Table 1.   Systematic names of examples instantiating the four basic argument forms

Assuming these three constituents and the corresponding possibilities, the PTA distinguishes between 2 x 2 x 9 = 36 systematic types of argument. While situating argument types that share the same form in the same quadrant, the additional constituent of the argument substance is added to the visualization of the PTA by horizontally distributing the combinations in the systematic variation pictured in Figure 5.
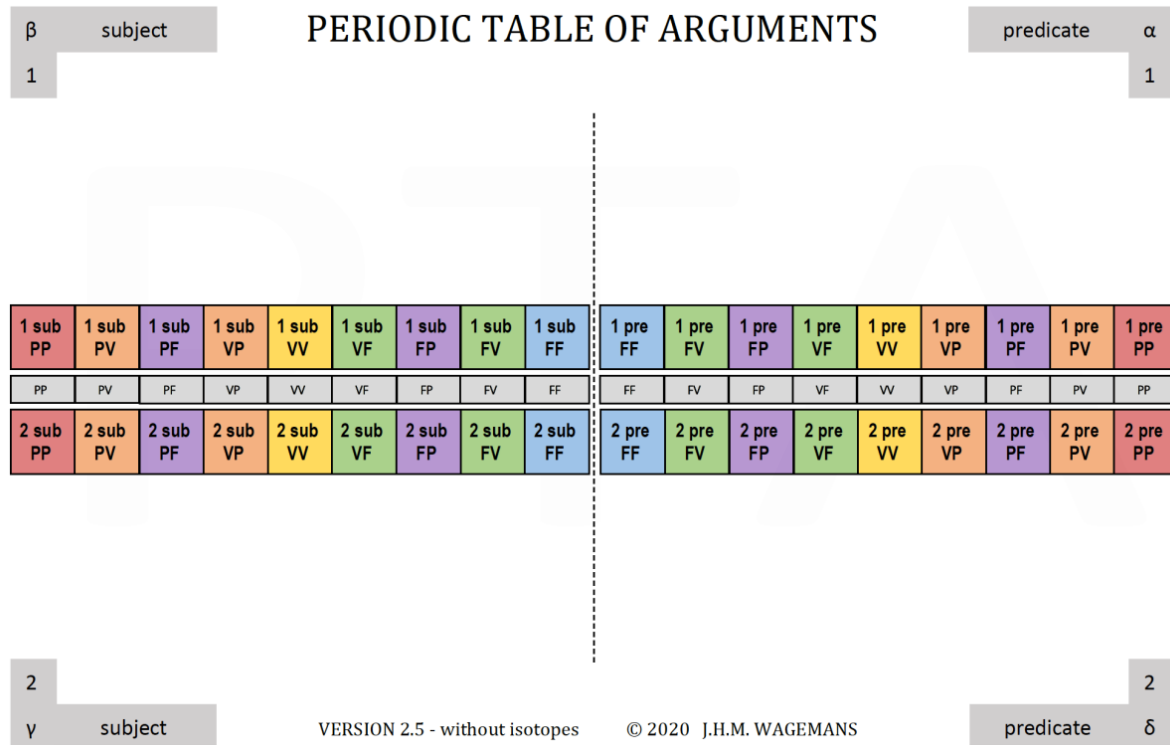

Figure 5.   The framework of the PTA allows for 36 systematic types of argument

3. Formulating the 'argumentative lever'

As said above, the PTA does not include what is traditionally called a 'connecting premise' or 'missing premise' in its conceptualization of argument. Instead, the analyst using the PTA for evaluative purposes derives what is called the 'argumentative lever' from the identification of the argument. In this section, I describe how such derivation takes place. I first present the most recent version of the so-called 'Argument Type Identification Procedure (ATIP)', which is developed to help the analyst to identify the type of any argument expressed in natural language.[5] Then, I explain how to formulate the argumentative lever based on this identification.

The ATIP starts with a functional analysis of the elements of the two statements that have been recognized as the 'conclusion' and the 'premise' of the argument under scrutiny and results in labelling that argument with a type indicator that systematically summarizes its characteristics. The procedure consists of several steps, which are explained below and illustrated through an example.

Step 1 – Label the textual elements

The theoretical framework of the PTA takes an argument to consist of two connected statements, one functioning as the 'conclusion' and the other as the 'premise' (Wagemans 2019, p. 60). To identify the type of argument, the analyst should first label its textual elements based on their pragmatic function. The following labels are in use:
- the text may contain a 'connector' such as *because* or *therefore* indicating the function of the statements as 'conclusion' and 'premise' (for lists of such indicators see, e.g., van Eemeren, Houtlosser and Snoeck Henkemans 2007; Stab and Gurevych 2017)
- the statements usually contain a 'subject', i.e., an entity about which something is said, and a 'predicate', i.e., what is said about that entity
- the subject and predicate together form the 'propositional content' of the statement
- apart from this propositional content, the statement may contain a 'doxastic commissive' such as *we believe that*, *it is true that*, and *in my humble opinion*, which are linguistic expressions of the arguer's commitment regarding the acceptability of the propositional content (Wagemans 2019, pp. 62-64)
- the statement may also contain a 'doxastic directive' such as *you should accept that*, which is a linguistic expression of the arguer's goal of convincing the addressee of the acceptability of the propositional content of the conclusion.

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[5] The version presented here is adapted from Wagemans (2020).

Example 1 – original text
Since the suspect left a long trace of rubber on the road, we believe that he was driving fast

Functional analysis of the elements of the statements

element	function
since	connector
the suspect left a long trace of rubber on the road	propositional content (premise)
the suspect	subject (premise)
left a long trace of rubber on the road	predicate (premise)
we believe that	doxastic commissive (conclusion)
he was driving fast	propositional content (conclusion)
he	subject (conclusion)
was driving fast	predicate (conclusion)

Step 2 – Standardize the argument

The labelling of the elements of the argument enables the analyst to reformulate it in the standard form "[subject (conclusion)] [predicate (conclusion)], because [subject (premise)] [predicate (premise)]". Such standardization may involve several transformations of the original text:

- regarding the statements
  - reordering of the statements to reflect the standard form "conclusion, because premise"
- regarding the connector
  - addition of the standard connector *because* between the conclusion and the premise
  - substitution of the original connector by the standard connector *because*
- regarding the non-propositional elements of the statements
  - hiding of the doxastic commissives and directives
- regarding the propositional content of the statements
  - anaphora resolution, i.e., the substitution of specific elements so that identical entities are referred to by identical words (preferably the most informative ones)
  - changing active to passive voice or the other way around in order to find a common subject or predicate.

Example 1 – original text
Since the suspect left a long trace of rubber on the road, we believe that he was driving fast

Reformulations toward the standardized version

reformulation	transformation
We believe that he was driving fast, since the suspect left a long trace of rubber on the road	reordering of the statements
We believe that he was driving fast, because the suspect left a long trace of rubber on the road	substitution of the connector *since* by *because*
He was driving fast, because the suspect left a long trace of rubber on the road	hiding of the doxastic commissive *we believe*
The suspect was driving fast, because the suspect left a long trace of rubber on the road	substitution of *he* by *the suspect* (anaphora resolution)

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Step 3 – Determine the argument form

The 'argument form' is an abstract representation of the specific constellation of the subjects and predicates expressed in the conclusion and the premise of the argument. Closely following logical conventions, subjects are indicated with letters *a*, *b*, etc., predicates with letters *X*, *Y*, etc. (predicates '⊤' and '⊥' expressing doxastic commitments 'true' and 'false'), and complete propositions with letters *p*, *q*, etc.

Within the theoretical framework of the PTA, four basic argument forms are distinguished, which is reflected in the visual representation of the table as divided into four quadrants (Wagemans 2019, pp. 64-67). Table 2 contains an overview of these forms, their names, and the corresponding quadrant of the table:

argument form	name	quadrant
a is *X*, because *a* is *Y*	first-order predicate argument	alpha
a is *X*, because *b* is *X*	first-order subject argument	beta
q is ⊤, because *r* is ⊤	second-order subject argument	gamma
q is ⊤, because *q* is *Z*	second-order predicate argument	delta

Table 2.   Argument forms distinguished in the PTA

For completing this step in the procedure, the analyst can use the decision tree pictured in Figure 6, which contains three heuristic questions as well as the corresponding instructions and outcomes depending on the answers to these questions.
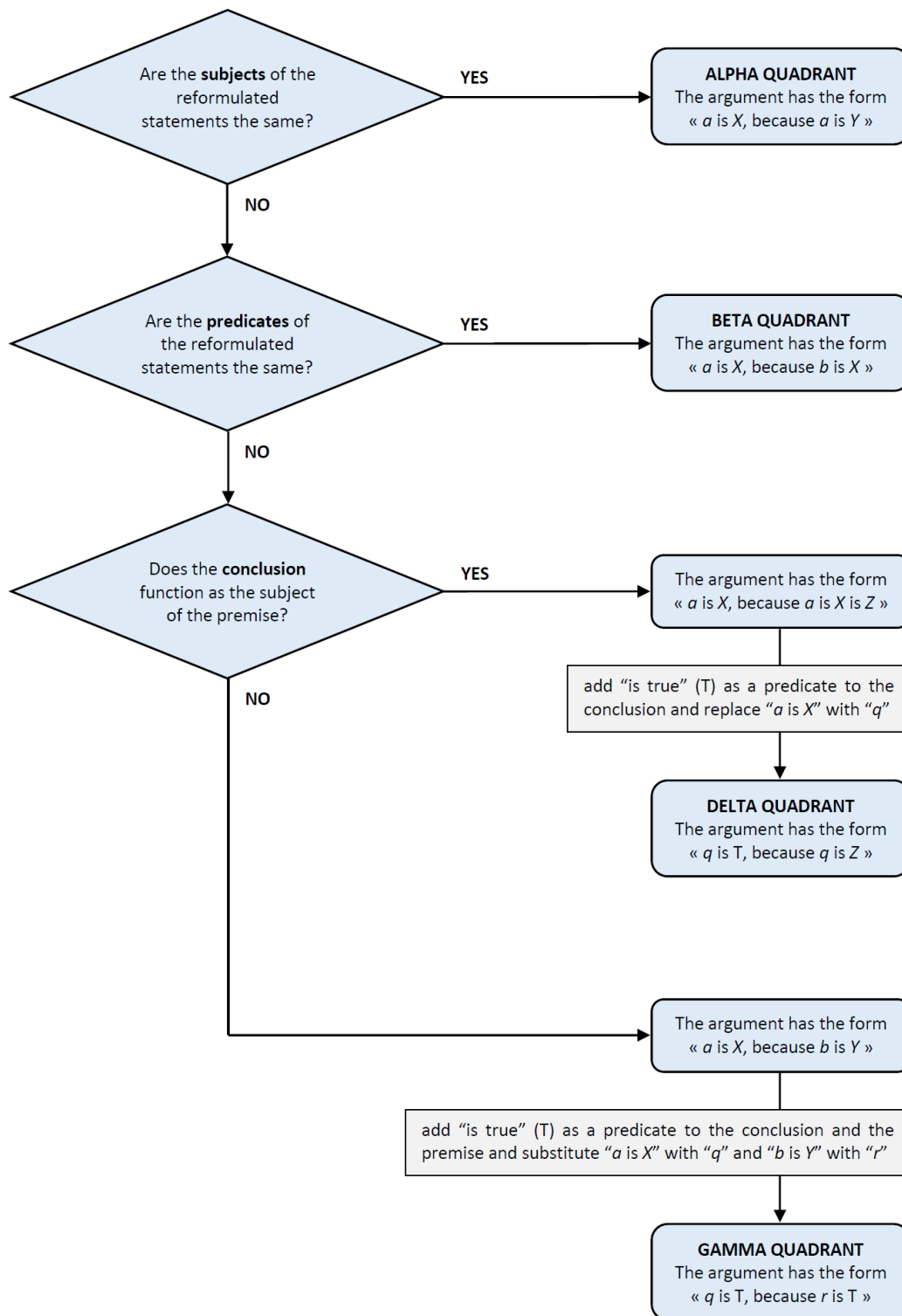
Figure 6.   Decision tree for determining the argument form

> The argument *The suspect was driving fast, because the suspect left a long trace of rubber on the road* combines a statement of fact (F) in the conclusion with another statement of fact (F) in the premise.
>
> **Determination of the argument substance**
>
> | | statement | type of statement |
> |---|---|---|
> | *conclusion* | *the suspect was driving fast* | statement of fact (F) |
> | *premise* | *the suspect left a long trace of rubber on the road* | statement of fact (F) |
>
> **Example 1 – reformulated version annotated with the argument substance**
> *The suspect was driving fast (F), because the suspect left a long trace of rubber on the road (F)*

Step 4 – Determine the argument substance

Apart from by its 'argument form', each type of argument distinguished within the theoretical framework of the PTA is characterized by its 'argument substance' (Wagemans 2016, pp. 7-8). This notion is defined as the specific combination of types of statements the argument instantiates. The labelling of the type of statement is done in accordance with a widely used tripartite typology of statements developed within debate theory that consists of statements of fact (F), statements of value (V), and statements of policy (P).

- a statement of fact (F) is defined as a description of a particular state of affairs that is or can be empirically observed in reality or that is or can be imagined to exist. In order for the analyst to distinguish them from statements of value, it may be helpful to consider the following subtypes and examples:
  - empirical statements, such as 'The suspect left a long trace of rubber on the road'.
  - existential statements, such as 'God exists'
  - predictions, such as 'The economy will grow'
- a statement of value (V) is defined as an evaluative judgment about a particular entity based on a subjective selection and weighing of assessment criteria. In order for the analyst to distinguish them from statements of fact, it may be helpful to consider the following subtypes and examples:
  - aesthetic judgments, such as 'The Corrections is a great novel'
  - moral or ethical judgments, such as 'Circumcision is reprehensible'
  - legal judgments, such as 'Unauthorized copying is not theft'
  - pragmatic judgments, such as 'Our plan for reducing CO2-emission is feasible'
  - logical judgments, such as 'This proposition is true'
  - hedonistic judgments, such as 'Paragliding is fun'
- a statement of policy (P), which is defined as a directive statement that expresses an advice, an incitement, or an imperative. The analyst may recognize statements of policy because of the presence of the term 'should' in combination with a verb expressing a particular action. Examples are:
  - advice, such as 'Children should not sleep with artificial lighting'
  - incitements, such as 'You should go to the gym'
  - imperatives, such as 'Go to your room'

By labelling both the conclusion and the premise of the argument in this way, the argument substance can be determined as one of the nine possible combinations of types of statements (FF, VF, PF, FV, VV, PV, FP, VP, PP).

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Step 5 – Provide the systematic name of the argument

The systematic name of an argument is a symbolic representation of the results of Step 3 and 4 of this procedure and thus contains information regarding the argument form and the argument substance. It consists of:
- the prefix "1" or "2", indicating a first-order or a second-order argument
- the infix "pre" or "sub", indicating a predicate or subject argument
- the suffix "FF", "VF", etc., indicating the types of statements instantiated by the argument

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The suspect was driving fast, because the suspect left a long trace of rubber on the road is a first-order predicate argument that combines a statement of fact with another statement of fact. Its systematic name is 1 pre FF.

Example 1 – reformulated version
The suspect was driving fast, because the suspect left a long trace of rubber on the road

Example 1 – reformulated version annotated with complete argument type information
The suspect (a) was driving fast (X) (F), because the suspect (a) left a long trace of rubber on the road (Y) (F) (1 pre FF)

After having presented how the analyst can identify the type of argument by making use of the Argument Type Identification Procedure (ATIP), I turn now explaining how they can derive the 'argumentative lever' from such identification. The lever of an argument is an expression of its underlying mechanism, which explains how a statement can establish or increase the acceptability of another statement. As such, the word 'lever' is taken from the same source domain as the word 'fulcrum'. While the fulcrum is defined as the term – i.e., the subject or predicate – that the conclusion and the premise of the argument have in common, the lever is defined as the relationship between the non-common terms (Wagemans 2019, p. 61).

Now what is the lever of a concrete argument expressed in natural language such as the example used to illustrate the ATIP? The answer to this question depends on the extent to which the analyst has available information about (1) the characteristics of the argument as analyzed during the procedure and (2) the discursive context in which the argument has been put forward. To illustrate this point, I now provide progressively more concrete formulations of the lever of an example of natural argument, namely the famous opening statement of Aristotle's *Metaphysica*.[6]

Example 2
All human beings by nature desire to know. A sign of this is our liking for the senses; for even apart from their usefulness we like them for themselves – especially the sense of sight, since we choose seeing above practically all the others, not only as an aid to action, but also when we have no intention of acting. The reason is that sight, more than any of the other senses, gives us knowledge of things and clarifies many differences among them. (Aristotle, *Metaphysica* 980a21-27, translation Irwin and Fine, 1995)

If the analyst only uses the information about the argument form, the formulation of the lever will be a fairly abstract one. Following the ATIP, the argument in the beginning of this text can be reconstructed as *All human beings by nature desire to know, because all human beings*

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[6] For more example analyses, please see www.periodic-table-of-arguments.org.

have a liking for the senses. This argument has the form '*a* is *X*, because *a* is *Y*' and can therefore be identified as a first-order predicate argument. The lever, being defined as the relationship between the non-common terms, can then be formulated as the relationship between *X* and *Y*, so between *by nature desire to know* and *have a liking for the senses*. Levers for the different argument forms are specified in Table 3.

argument form	fulcrum	abstract lever
a is *X*, because *a* is *Y*	*a*	*Y* R *X*
a is *X*, because *b* is *X*	*X*	*a* R *b*
q is ⊤, because *r* is ⊤	⊤	*q* R *r*
q is ⊤, because *q* is *Z*	*q*	*Z* R ⊤

Table 3.   Abstract levers based on information about the argument form

To provide a more concrete formulation of the lever, the analyst can also take into account the argument substance. Following the ATIP, the argument can be identified as an FF argument. This means that the relationship between the predicates can be seen as a relationship between two different factual properties attributed to the same subject. At this point, the analyst can use the various '1 pre FF' arguments already identified in the PTA as a heuristic. As pictured in Figure 7, a visualization of the Alpha Quadrant hosting all the first-order predicate arguments, the '1 pre FF' arguments have levers formulated as '*Y* is a sign for *X*', '*Y* is a cause of *X*', '*Y* is an effect of *X*', and '*Y* is correlated with *X*'.
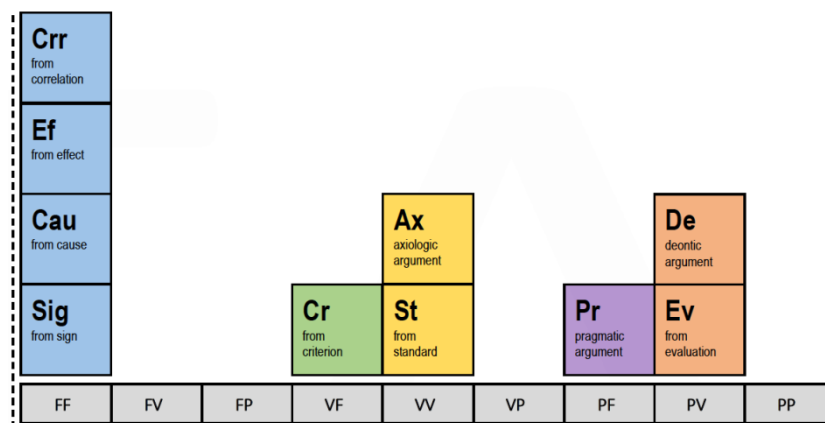

Figure 7.   The Alpha Quadrant of the PTA.

As mentioned above, to justify the choice of concrete lever that fits the argument under scrutiny, the analyst can also refer to the discursive context in which the argument has been put forward. In this case, Aristotle explicitly uses the term 'sign' to qualify the argumentative relationship between the conclusion and premise, thereby giving the analyst an extra reason to formulate the lever as *have a liking for the senses* is a sign for *by nature desire to know*.

Once the lever has been formulated, its solidity can be evaluated. As explained in Hinton and Wagemans (forthcoming), the evaluation of this aspect of the argument reflects both the informal logic tradition of questioning the relevance and sufficiency of an argument and the dialectical tradition of asking critical questions, some of which pertain to the

connection between the premise and the conclusion of the argument.[7] In this case, to examine the solidity of the lever, the evaluator should examine the extent to which *have a liking for the senses* is a sign for *by nature desire to know*. Although the outcome of the evaluation is a subjective judgement of the evaluator, by following the method just explained such judgment pertains to an expression of the underlying mechanism of the argument that is systematically derived from an identification of its type.

4. Conclusion

The argument categorization framework of the Periodic Table of Arguments (PTA) takes an argument to consist of only two statements, one functioning as the premise and the other as the conclusion, which means that it excludes from its conceptualization of argument the element traditionally called the 'connecting premise' or 'missing premise'. Given that this element is one of the usual objects of evaluation of an argument, I addressed in this paper the question of how the PTA can be used for evaluative purposes by explaining how the analyst can derive the so-called 'lever' of an argument from an identification of its type.

The method, so I believe, has some advantages compared to traditional ways of analyzing the connection between the premise and conclusion of an argument. The first advantage concerns its procedural nature. Different from comparative methods, which identify connecting premises based on a subjective comparison with a list of predefined argument schemes, the lever is derived from a systematic analysis of the characteristics of the argument as expressed in the original text. Following this procedural method not only makes the analysis more transparent and robust but also prevents the analyst from reconstructing the text based on preconceived ideas of what an argument should consist of and therefore from running the risk of providing a biased evaluation of how the premise establishes or increases the acceptability of the conclusion.

A second advantage of deriving the lever instead of adding a predefined missing premise is that such a lever can be formulated on different levels of concreteness, depending on the information the analyst has available. Based on the argument form, the lever can be formulated more abstractly, for instance, as a relationship between predicates. Bringing in additional information about the argument substance enables the analyst to formulate the lever, for example, as a relationship between factual properties. If there is textual evidence about how the arguer expresses the relationship between the non-common terms, like in the case of the example argument taken from Aristotle's *Metaphysica* discussed above, the analyst can use the same keyword as the arguer to formulate the lever of the argument. I think such cautiousness in providing a concrete formulation of the lever would again prevent the analyst from engaging in the hermeneutical activity of 'hineininterpretieren'.

Thirdly and finally, the development of a procedural instead of a comparative method for argument identification and evaluation prepares the ground for a further formalization of these activities, which is a necessary step for the subsequent development of computational applications.[8] As said above, the outcome of an assessment of the solidity of the lever of an argument is a subjective judgment of the evaluator. And I doubt whether such judgment can ever be given by an AI engine, if this would be desirable at all. But I also think that being aware of the importance of humans having the last word about what they find acceptable does not have to turn us into techno-repellent Luddites. On the contrary, it may well be the case that sufficiently formalized argumentation theoretical insights are crucial for developing

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[7] See, e.g., de Jong (2019).
[8] An elaboration of this method can be found in Gobbo, Benini and Wagemans (2019).

explainable, white-box AI engines that can assist humans in performing vital tasks such as making decisions based on facts and reasonable arguments.

By contrasting the procedural method presented in this paper with the traditional comparative method, I do not mean to depreciate the use of classical and modern dialectical and rhetorical accounts of the types of argument. The research presented in this paper has only scratched the surface of the connection between the systematic names used in the theoretical framework of the PTA and the traditional names of the types of arguments. In several of the cases analyzed so far, the keyword used in the formulation of the lever is also to be found in the traditional name. If the lever contains, for instance, the term 'sign' in order to substantiate the relationship between the predicates, the corresponding traditional name of the argument is 'argument from sign'. Extensive research into these correspondences, I believe, would greatly benefit the further systematization of argument description and classification, which is something that motivated the development of the PTA in the first place.

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