May 14th, 9:00 AM - May 17th, 5:00 PM

Commentary on Yanal

G C. Goddu

Author: G.C. Goddu
Commentary on: R. Yanal's "Linked and Convergent Reasons – Again"

Intuitively, in some arguments the premises link together to form a single reason for the conclusion; in others the premises each constitute separate reasons which converge on the conclusion. Whether this intuitive difference indicates a real structural difference between linked and convergent arguments is a matter of significant debate amongst informal logicians. In Douglas Walton's comprehensive survey of possible candidates for the linked/convergent distinction, he concludes that Robert Yanal's proposed test (Yanal, 1991) for distinguishing linked and convergent arguments is the best (Walton, 1996). In more recent work (Yanal, 2003), Yanal concedes that his proposal violates numerous conditions that have been presumed to hold for the linked/convergent distinction, but he claims that all extant versions of the distinction face the same problems. Regardless of whether Yanal is correct, I shall argue, after briefly presenting and explicating his proposal, that whatever distinction his proposal is demarcating, it is not the linked/convergent distinction.

According to Robert Yanal, "convergent arguments have premises whose probabilities sum in the ordinary way. Linked arguments have premises whose probabilities don't sum in the ordinary way. Linked arguments have reasons that 'jump' ordinary probability sums"(Yanal, 2003, 3-4). But what probabilities exactly are being summed and what is it for them to sum 'ordinarily'?

Suppose you have two premises P1 and P2 and a conclusion C. Let the probability of C given P1 be x and probability of C given P2 be y. What then is the probability of C given both P1 and P2? In very specific circumstances, the probability is just $x + y(1- x)$. Put another way the probability is $(x + y) - xy$, i.e. add the percentage of cases in which P1 makes C true to the percentage of cases in which P2 makes C true and subtract once the percentage of cases in which both P1 and P2 make C true, for otherwise those cases are being double counted. According to Yanal, if the probability of C given both P1 and P2 is $x + y(1- x)$, then the conditional probabilities sum ordinarily; otherwise they do not. (See Appendix 1.) Note then that even though Yanal writes "premises whose probabilities sum in the ordinary way"(Yanal, 2003, 3) or "the premises don't sum in the ordinary way"(Yanal, 2003, 3), it is not the probabilities of the premises that are being summed, but rather the conditional probabilities of the conclusion given each premise. Accordingly, if the probability of the conclusion given the premises is the ordinary sum of the relevant conditional probabilities, then Yanal says the argument is convergent. If the probability of the conclusion given the premises is greater than the ordinary sum, then the argument is linked.

Consider now Yanal's examples:

(A) (1) She's either in the study or in the kitchen.
(2) <u>She's not in the study.</u>
(3) She's in the kitchen.

and

(B) (1) She typically goes to the kitchen around this time to make a cup of tea.
(2) I just saw her walking in the general direction of the kitchen.
(3) She's in the kitchen.

Intuitively, A is linked, while B is convergent. According to Yanal, his theory respects these intuitions.

But consider the following example of Yanal's:

(C) (1) Crow 1 is black; (2) Crow 2 is black ....; (100) Crow 100 is black. / All crows are black.

Yanal points out that assuming the probability of the conclusion given each premise separately is 0.001, then the ordinary sum is approximately 0.02, but "[i]ntuitively, though, 100 observations of black crows should make it more than .02 probable that all crows are black"(Yanal, 2003, 4). Hence, he argues (C) is linked. But the following is also intuitively true--each of the premises is independently relevant to the conclusion. In addition, intuitively, the premises of (A) are not independently relevant, while the premises of (B) are. Hence, the intuitive independent relevance view, like Yanal's, respects our intuitions concerning arguments (A) and (B), but differs concerning (C).

So which intuitions are truly relevant? Just assuming that it is our intuitions concerning the actual support and the ordinarily summed support begs the question against a view based on our intuitions concerning independent relevance. Perhaps we can decide which intuitions are relevant by seeing which proposals violate any conditions on an adequate distinction. The linked/convergent distinction, according to Yanal, has been presumed to satisfy the following four conditions:

1. Priority: An argument's linked/convergent structure is to be determined prior to cogency.
2. Neutrality: An argument's linked/convergent structure can be determined independently of an argument's cogency.
3. Comprehensiveness: All multiple-premise arguments have a linked/convergent structure.
4. Correctness: Each multiple-premise argument has exactly one correct linked/convergent structure.

Unfortunately, Yanal explicitly concedes that his ordinary summing proposal fails to satisfy these conditions. Still, Yanal rejects the conditions, not his proposal. Hence, satisfying the conditions will, given Yanal's rejection of them, not be a neutral test between conflicting intuitions.

Still, to ameliorate his rejection of the conditions, Yanal claims that "any way of distinguishing linked from convergent reasons that relies on the way the premises support their conclusions, which all extant distinctions in one way or the other do, will ultimately have to face up to the same problems"(Yanal, 2003, 5). So if Yanal is correct, his proposal remains no worse off than its competitors, since all other proposals face the same problems.

Whether Yanal is correct to claim that all extant proposals will face the same problems is far from clear. Yanal offers no support for the claim. Fully assessing Yanal's claim, since it would involve either (i) determining some general conditions that the linked/convergent distinction must meet and showing that they conflict with the four given conditions or (ii) surveying and assessing all extant versions of the distinction, is far beyond the scope of these comments. Regardless, I will make three brief comments.

Firstly, James Freeman's independent relevance view (Freeman, 2001), which I take to be Yanal's most significant rival, does not appear to violate priority or neutrality. In addition, I think Freeman could reasonably argue that on his view the argument:

(D) (1) All cats are mammals.
(2) <u>All dogs are mammals.</u>
(3) All cats are dogs.

is linked and not convergent, and so this example does not show that Freeman's view will violate comprehensiveness and correctness. Admittedly, sorting out and assessing Freeman's most recent version of his view is also beyond the scope of these comments.

Secondly, (D), contra Yanal, does not violate comprehensiveness and correctness even on his ordinary summing view. If we assume that the probability of the conclusion given both premises is zero, then given that x and y are both zero, the ordinary sum of x and y is zero. The actual support is equal to the ordinary sum, so according to Yanal's test the argument is convergent. Indeed, more generally Yanal is wrong to suggest that his proposal violates what he calls correctness--no argument can be both linked and convergent. According to his ordinary summing view no argument can be both linked and convergent, for it is impossible for the conditional probability of the conclusion given the premises to be both equal to and greater than the ordinary sum of the relevant conditional probabilities. (Though, as we shall see later, Yanal's proposal still violates comprehensiveness.)

Thirdly, just for good measure, here is a fifth condition which, unlike the others, Yanal accepts, but which his theory also violates:

5. Deductive Validity: All multi-premise deductively valid arguments are linked (Yanal, 2003, 4).

But consider the following arguments:

(E) (1) If time travelers can kill their younger selves, then time travelers cannot kill their younger selves.
(2) <u>Time travelers can kill their younger selves.</u>
(3) Time travelers cannot kill their younger selves.

or

(F) (1) Even though both were proximate at the time, neither Smith nor Jones witnessed the crime.
(2) <u>Smith is almost totally blind.</u>
(3) Smith did not witness the crime.

In the case of (E), x is 1 and y is 0. Hence the ordinary sum is 1. The actual support is also 1, so the argument is convergent even though it is deductively valid. In the case of (F), x is 1 and y is presumably greater than zero. Still, given that x is 1, x + y (1 -x) will equal x or 1. Hence, the ordinary sum is 1. The actual support is also 1, so again the argument is convergent even though it is deductively valid. Further examples abound.

Regardless, perhaps rejecting the deductive validity condition is not problematic. Mark Vorobej, for example, has argued that the deductive validity condition be dropped (Vorobej, 1995). If Yanal is also willing to give up the deductive validity condition, then, assuming for the moment that Yanal is correct in his claim that all extant proposals will fare no better than his satisfying the conditions, the question remains--how are we to assess Yanal's proposal?

My strategy in what remains will be to argue that Yanal's proposal classifies (B) incorrectly. Since (B), unlike (C), is supposed to be obviously or pre-theoretically convergent, if his proposal classifies (B) incorrectly, then whatever property ordinary summing indicates it is not convergence.

Consider first the following argument:

(G) (1) A shot at the target.
(2) <u>B shot at the target.</u>
(3) Therefore the target was hit.

Suppose that the probability that the target was hit given that A shot at it is 0.9 and the probability that it was hit given that B shot at it was 0.8. So in 0.9 of the cases A hits the target and in 0.8 B hits the target. Assuming that A's hitting the target is stochastically independent of B's hitting the target, in 0.9 multiplied by 0.8 of the cases, i.e., 0.72, they both hit the target. Hence, the ordinary sum probability that the target was hit is, 0.9 + 0.8 - 0.72, or 1.7 - 0.72, or 0.98. Assuming that the conclusion is equivalent to "the target was hit by A or the target was hit by B," then the actual support P1 and P2 provide to C in this case is indeed 0.98. Hence, according to Yanal's proposal (G) is linked. I suspect this result matches our intuitions.

But now consider the following argument:

(H) (1) The mail was delivered today.
(2) <u>Tom went to work.</u>
(3) It is a weekday.

Suppose the mail is delivered on all days but Sunday. Hence, the probability of the conclusion given the first premise is 5/6 or 0.83. Suppose Tom works five out of seven days, but 30% of his days off are weekdays and 70% weekends. In addition, given he is off on a weekday each day is equally probable and given that he is off on a weekend either day of the weekend is equally probable. In this case P2 makes it 0.88 probable that it is a weekday. Now the ordinary sum of the conditional probabilities is 0.98, but the actual conditional probability of the conclusion given the premises in this situation is just under 0.94. (See Appendix 2.)

What then should we say about Yanal's proposal based on (H)? Firstly, the actual support is less than the ordinary sum, so is the argument linked or not? Yanal talks as if to be linked the actual strength has to be greater than the ordinary sum, but he also says "the premises of linked arguments together make their conclusion far more likely true than each premise considered separately"(Yanal, 2003, 3) which is also satisfied by (H). Regardless, at the very least, the support the premises give the conclusion in (H) is not the ordinary sum and so the argument is not linked.

(G) is convergent, but (H) is not, even though, intuitively, both seem convergent. Yanal's canonical example of a convergent argument, viz. (B) also seems convergent, but is it really or is it another example like (H)? Consider 100 cases in which it is her typical kitchen time. Given Yanal's proposed probability, in 80 such cases she will be in the kitchen and in 20 she will not. Now suppose in all 100 of those cases I was present to view her movements just prior to her arriving at her destination. Given that according to Yanal I am correct about what I see 75% of the time, in 60 of the 80 cases in which she is in the kitchen, I will have seen her heading for the kitchen. In 15 of the 20 of the cases in which she is not in kitchen I will not have seen her heading to the kitchen. In the remaining five cases in which she is not in the kitchen, I will have seen her heading for the kitchen. (See Appendix 3.) Hence, in 65 cases it is both kitchen time and I saw her heading that way, but in only 60 of them, or just under 93%, will she be in the kitchen. But as Yanal points out, the ordinary sum in this case is 0.95. Hence, the actual support in (B) is not the ordinary sum, and so, contra Yanal, according to his own proposal (B) is not convergent.

Given that in both (B) and (H) the actual support is less than the ordinary sum and Yanal holds that in linked arguments, the actual support is greater than the ordinary sum, perhaps Yanal can simply revise his proposal and hold that in convergent arguments the actual support is equal to or less than the ordinary sum, while in linked arguments the actual support is greater than the ordinary sum. This fix is problematic. Consider (H) again, but in the following circumstances: Tom works six days out of seven instead of five out of seven; all his days off are weekend days; and he works only one Saturday in 100. In this case, the ordinary sum is 0.83 + 0.83(0.17), or 0.97, but the actual strength is 500/501 or 0.998. Hence, in this case the revised proposal would judge (H) to be linked.

If the actual support being the ordinary sum is not an indicator of convergence, what does it indicate? At the beginning of this paper I said that in very specific circumstances the conditional probability of the conclusion given both premises is just $x + y(1 - x)$, which is equivalent to $(x + y) - xy$. But what exactly are those circumstances? Yanal just takes ordinary summing versus non-ordinary summing as a sign of the convergent-linked distinction, but does not delve deeper into the conditions required for the ordinary sum to equal the actual support. Notice however that $(x + y) - xy$ is in fact a particular case of the general disjunction rule for probabilities, i.e. given x is the probability of P and y is the probability of Q, then the probability of P v Q, assuming P and Q are stochastically independent, is $(x + y) - xy$. (Skyrms, 2000, p.115, p. 122). If this identity is not just a coincidence, and I strongly suspect it is not, then the identity explains why the ordinary sum is equal to the actual sum in the case of (G). Firstly, the conclusion of G is, in the circumstances, equivalent to the disjunction "A hits the target or B hits the target." Secondly, the probability of "A hits the target" just is x and the probability of "B hits the target" just is y. Finally, "A hits the target" is stochastically independent of "B hits the target," for in this case A's shooting at the target and A's rate of success is independent of B's shooting at the target and B's rate of success. Hence, the probability of the conclusion given the premises in the case of (G) is $(x + y) - xy$, i.e. the ordinary sum.

In the cases of (B) and (H), however, neither conclusion is equivalent to a relevant disjunction. In addition, in the case of (G) it makes perfect sense to consider 100 cases in which both A and B shot at the target and say that in 90 of those cases the target was hit because A hit it and in 80 the target was hit because B hit it (and by the way in 72 cases the target was hit because both hit it). But in the case of (B), for example, it does not make sense to consider 100 cases in which it's both kitchen time and I saw her heading that way and say that in 80 of those cases she was there because it was kitchen time and in 75 because I saw her. The difference I take it is that in the case of (G) the premises are probabilistic causes of the conclusion, whereas in (B) and (H) the premises are merely probabilistic indicators of the conclusion. Regardless, the separation of cases required for appropriately applying the disjunction rule is not possible in the case of either (B) or (H).

(B), (G), and (H) are all, I take it, equally canonical examples of convergent arguments and yet Yanal's proposal labels only (G) as a convergent. Hence, ordinary summing does not indicate convergence, but at best picks out a very specific subclass of convergent arguments.

Appendix 1

The given formula works only for two premise arguments. For three premise arguments the formula is $x + y(1 - x) + z(1 - x)(1 - y)$. I trust the pattern for determining the formula for any number of premises n is clear, though certainly as n gets large the formula gets quite cumbersome. Alternatively, one can just reiterate uses of the given two premise formula. For example, for a three premise argument, find the ordinary sum of x and y, call it s, and then find the ordinary sum of s and z.

Appendix 2

Consider 100 weeks or 700 days. Assume there are no holidays. The mail comes on all days but Sundays. Of the 600 days on which the mail comes, 500 are weekdays. Hence, given the mail came, the probability that it is a weekday is 500/600 or approximately 0.83. Tom goes to work 500 days. Of the 200 days he does not go to work, 70% or 140, are weekend days and either Saturday or Sunday is equally likely. Hence, he does not go to work 70 Saturdays and 70 Sundays. Hence, he goes to work on 30 Saturdays and 30 Sundays. Of the 200 days he does not go to work, 30% or 60 are weekdays, and each weekday is equally likely. Hence, he does not go to work on 12 Mondays, 12 Tuesdays, etc. Hence, he does go to work 88 days of each weekday. Hence, given that he goes to work, the probability that it is a weekday is 440/500 or 0.88. The ordinary sum of 0.83 and 0.88 is $0.83 + 0.88(1 - 0.83)$ or $0.83 + 0.88(0.17)$ or $0.83 + 0.1496$ or approximately 0.98. The actual support is the percentage of cases in which it is a weekday given that both the mail came and Tom went to work. The mail comes and Tom goes to work on 470 days; 440 weekdays and 30 Saturdays. Hence, the actual probability is 440/470 or approximately 0.936. Hence, the actual support is less than the ordinary sum.

Appendix 3

The probability assignments here assume that I am correct 75% of the time with respect to what I see relative to her being or not being in the kitchen. If we drop the relative to her being or not being in the kitchen, determining how the two premises interact is extremely difficult, if not impossible. For example, if I saw her heading for the bedroom and she's in the study, I am in one sense wrong about what I saw. But since seeing her head for the bedroom is also a case of seeing her not heading toward the kitchen and she is in fact not in the kitchen it is also a case in which I am right about what I saw.

References

Freeman, James B.: 2001, "Argument Structure and Disciplinary Perspective." *Argumentation* 15, 397-423.

Skyrms, Brian. 2000. *Choice and Chance*. 4th edition. Belmont, CA: Wadsworth.

Walton, Douglas. 1996. *Argument Structure: A Pragmatic Theory*. Toronto: University of Toronto Press.

Yanal, Robert J. 2003. "Linked and Convergent Reasons--Again", In *Informal Logic at 25: Proceedings of the Windsor Conference.* J. Anthony Blair, Daniel Farr, Hans V. Hansen, Ralph H. Johnson, & Christopher W. Tindale (Eds.). Windsor, ON: OSSA, 2003. CD-ROM.

Yanal, Robert J.1991. "Dependent and Independent Reasons," *Informal Logic* 13, 137-144.