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## *The War-Weariness Hypothesis: An Empirical Test\**

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The war-weariness hypothesis and other hypotheses of negative addictive contagion assert that war induces in its participants an inhibition against subsequent war for several years. These national-level hypotheses are tested empirically by examining the addictive effects of wars between the great powers over the period 1500–1975. The findings are consistent over a variety of indicators of contagion: there is no empirical support for negative addiction hypotheses. A great power war does not reduce the likelihood of a subsequent war involvement by one of its participating powers, and the distribution of elapsed time between wars is consistent with an exponential distribution derived from the null hypothesis of no contagion. The likelihood of a second war is unaffected by the seriousness of the first war, and general wars have no distinctive contagion effects. Nor does the frequency of great power wars in one period affect the frequency of wars in the following period. Finally, there is no evidence that these patterns of contagion change over the five-century span of the modern system.

It is now commonplace to argue that the United States' proclivity toward military intervention in the Third World in the period immediately following the Vietnam War was lessened by a "war-weariness" induced by its Vietnam experience (Holsti and Rosenau, 1984). Britain and France also appear to have been affected by war-weariness immediately after World War I, and undoubtedly other examples could be cited in support of the argument that a state's tendency toward war or perhaps even the use of force short of war may be tempered by a recent war experience. In addition, there are good theoretical reasons for expecting that a nation's war involvement might, for a time at least, inhibit its subsequent war behavior. This is expressed by Richardson (1960a) in his version of the well-known "war-weariness hypothesis": "A long and severe bout of fighting confers immunity on most of those who have experienced it" (p. 232). But in spite of the Vietnam syndrome and other comparable examples for other states, and in spite of the inherent plausibility of the war-weariness hypothesis, numerous empirical studies have concluded that there exist no regularized patterns of war-weariness in the international system (Singer and Small, 1972, 1974; Levy, 1982b; Garnham, 1983). This tension between the apparently obvious implications of particular cases and the conclusions of systematic empirical

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studies has led to continued attempts to discover regularized patterns of war contagion.

Although recent findings of the absence of systemic-level contagion are consistent with a long line of empirical research on contagion and periodicity going back to Richardson (1960a, pp. 232–52; 1960b, pp. 128–31) and Sorokin (1937, pp. 352–60), they do not necessarily rule out the existence of a regularized pattern of war-weariness on the national level. Since most theoretical discussions of the war-weariness hypothesis *per se* treat it as a national-level phenomenon, the aim of this study is to test the war-weariness hypothesis and other hypotheses of addictive contagion by examining the national war behavior of the great powers.<sup>1</sup>

### Theoretical Considerations

There are several theoretical reasons why a nation's war involvement might reduce the likelihood of its participation in another war in the period immediately following. As the war-weariness hypothesis suggests, war may induce a general revulsion against war and an immunity against subsequent military action until the memory of war fades, when a new generation may approach war with a new enthusiasm. As Richardson (1960a) noted, "This acquired immunity is not permanent but fades out after a decade or two . . . there arises a new generation, not rendered immune by experience" (p. 232). This argument was advanced previously by Toynbee (1954):

It is manifest that the survivors of a generation that has been of military age during a bout of war will be shy, for the rest of their lives, of bringing a repetition of this tragic experience either upon themselves or upon their children, and that therefore the psychological resistance to any move towards the breaking of a peace that the living memory of a previous war has made so precious is likely to be prohibitively strong until a new generation that knows War only by hearsay has had time to grow up and to come into power. (p. 322)

Toynbee (1954) carried his generational hypothesis to its logical end, however, and suggested that for the next generation war may actually beget war: "A bout of war, once precipitated, is likely to persist until the peace-bred generation that has lightheartedly run into war has been replaced, in its turn, by a war-worn generation whom these inexperienced war-mongers have sent to the shambles" (p. 322). In Toynbee's scheme, then, addictive conta-

<sup>1</sup>This follows the analytical distinction between "addiction" and "infection" (Davis, Duncan, and Siverson, 1978, p. 777), or "reinforcement" and "spatial diffusion" (Most and Starr, 1980, p. 933). Addiction or reinforcement refers to the contagious effects of a war on the probability of a subsequent war involving one of the belligerents in the first war, whereas infection or spatial diffusion affects the subsequent war behavior of other actors. Each form of contagion can be either positive or negative.

gion may be either negative or positive depending on a society's generational cycle.<sup>2</sup> As a result, his version of the war-weariness hypothesis is weakened considerably.

There are a number of theoretical problems with the war-weariness hypothesis. Both the Toynbee and Richardson versions assume that war-weariness is induced by any war, or at least any long or destructive war, regardless of whether the state was victorious and regardless of the territorial, economic, or political gains. A victorious war might actually increase the likelihood of a later war by increasing a state's power and hence its ability to fight again; by inflaming the nationalistic passions and jingoistic attitudes of society as a whole; by bringing to power an elite whose political power is based largely on its successful conduct of war and who may have an incentive to continue the bellicose policies that brought it to office; or by creating or reinforcing a cultural norm which regards war as a legitimate instrument of national policy. Even an unsuccessful war might increase the likelihood of a subsequent war, by generating throughout society demands for revenge, as the post-World War I German case indicates (Grathwol, 1980). Particularly costly wars might intensify revanchist sentiment and the desire to revenge earlier losses, rather than increase war-weariness. It should also be recognized that the reaction to war may not be the same for all segments of society. A costly and unsuccessful war might induce weariness in some but demands for revenge in others. The critical questions concern what segments of society share the hypothesized war-weariness, whether these attitudes are also shared by the decision-making elite, and how much influence each of these groups has in the policymaking process. The war-weariness hypothesis is theoretically incomplete in that it fails to provide the linkages between war-weariness conceived as a social phenomenon and subsequent decisions regarding war and peace by political decision-makers.

It should be emphasized that if war-weariness is defined as a war-induced revulsion against subsequent war among certain segments of society, then the "war-weariness hypothesis" is only one of several causal mechanisms leading to negative addictive contagion. The depletion of a nation's resources by war, leaving it incapable of the rational initiation of

<sup>2</sup> Toynbee conceded, however, that the hypothesized generational cycle of war and peace cannot fully account for the "complete War-and-Peace Cycle" consisting of general wars, breathing space, supplemental wars, and general peace. This complete cycle spans 100 years or four generations, and Toynbee (1954, pp. 251-54) suggested that these complete cycles can be better explained in terms of the balance of power and the underlying dynamics of the international system. Similarly, long-cycle theory and related theories of world system dynamics suggest that the probability of war is largely a function of the changing structure of the international system or a state's changing power position within that system (Modelski, 1978; Thompson, 1983; Gilpin, 1981; Doran, 1983).

another war, might have the same result. A decisive and victorious war might resolve all outstanding issues and leave a state so satisfied with its new position that a subsequent war is unnecessary, and it might also deter the initiation of wars by others. Alternatively, an unsuccessful war might induce a change in the political elite and bring to power those committed to a more peaceful policy.<sup>3</sup> Thus war-weariness is only one of several paths by which war might inhibit subsequent war, so that an empirical finding of a reduced propensity toward war in the period following an earlier war would not necessarily confirm the war-weariness hypothesis.

War-weariness and other sources of a reduced propensity toward war are conceived here as intervening variables in hypotheses which predict that after one war a state is less likely to become involved in a subsequent war. This status of war-weariness as an intervening variable between the occurrence of one war and the outbreak of a second war leads to yet another problem. Even if it were true that somehow war-weariness or other considerations induce inhibitions in decision-makers which leave them disinclined to *initiate* a war, it does not necessarily follow that they would be less likely to become *involved* in a war. Such a psychological inhibition against war may actually make war *more* likely by creating an appearance of weakness and undermining deterrence. Other states might be tempted to take this opportunity to resolve long-standing disputes or advance other interests by increasing their coercive pressure. While such pressure might be effective in extracting the desired concessions from the weary state, it might also backfire and lead to a conflict spiral and war by miscalculation. Similarly, a state whose military and economic resources are depleted by one war may be unprepared to initiate another war during its period of recovery, but this does not mean that its probability of war involvement is diminished. Its very weakness may increase the likelihood of war by providing an incentive for others to attack.

Thus, under certain conditions the consequences of war-weariness may be precisely the opposite than the predicted reduction in the likelihood of war. In conjunction with our earlier survey of propositions suggesting why war might beget war, this suggests that theoretical arguments for positive addictive contagion are as plausible as those for war-weariness or other forms of negative addiction. These processes need not act independently, of course, and the simultaneous or sequential operation of both positive and

<sup>3</sup> Or, a victorious war might bolster the political position of an existing regime and increase its proclivity to resort to bellicose policies in the future as a means of increasing domestic political support. Many of these tendencies can be further reinforced by a variety of other variables, including the cognitive beliefs and psychological processes of decision-makers. For example, Jervis (1976, chap. 6) emphasized the importance of the last major war in shaping the lessons decision-makers learn from history.

negative addictive processes only increases the complexity of the question of contagion. Furthermore, positive and negative contagion processes may each be the product of distinct social-psychological, political, or economic responses to a previous war. There is neither adequate theory nor adequate data to permit a thorough empirical analysis of the interaction of all of these distinct processes. Whether the net effect of all of these contagion processes is positive or negative, to beget war or to inhibit war, is an important question in itself, however. The establishment of an empirical law, even if we lacked a complete theoretical explanation, would increase our descriptive knowledge of international behavior and enhance our predictive power. In addition, the discovery of a consistent pattern of contagion may have some bearing on several hypotheses regarding specific contagion processes and thus aid in our testing of those hypotheses.

#### *Empirical Studies of War Contagion*

There have been several empirical studies of war contagion, but these have yet to resolve the debate. Most studies have found that the *occurrence* of one war has no impact on the likelihood of subsequent war in the international system (Richardson, 1960b, pp. 128–31; Singer and Small, 1972, pp. 205–7; Singer and Small, 1974, pp. 279–82; Levy, 1982b). There is more evidence that the *expansion* of war follows an infectious process (Davis, Duncan, and Siverson, 1978), and that alliances (Siverson and King, 1979) and borders (Richardson, 1960b, pp. 273–87; Most and Starr, 1980, p. 932) play key roles in this process. However, neither the absence of contagion on the systemic level nor these findings of infectious contagion are directly relevant to the question of addictive contagion in general or war-weariness in particular.

Of greater interest are the few national-level studies of contagion, but these findings are somewhat mixed. Singer and Small (1974, pp. 283–84) find that neither initiators nor defenders in a war in the nineteenth or twentieth century are very likely to initiate another war within a decade, though winners are far more likely to initiate another war than losers. This leads them to conclude that victorious war begets war. But they also conclude that this “simple proposition is in fact a rather complex one, and that the alternative ways of interpreting and testing it (via many alternative indicators) lead to rather different conclusions. The evidence, then, is far from complete” (Singer and Small, 1974, p. 284). In a later article Singer and Cusack (1981) made only limited headway in resolving the question of the contagious effects of victory and defeat in war. Using the length of the interwar peace as the measure of contagion, they found some propensity of victorious states toward early reentry into war, but found no inhibition against war for defeated states (Singer and Cusack, 1981, pp. 413–15). In

fact, they found that the mean interval to the next war is even shorter for defeated states than for victorious states; while this difference is not statistically significant, it does point toward a revenge hypothesis rather than the war-weariness hypothesis. In a similar study, Garnham (1983) found that victorious major powers are no more likely than losers to initiate a subsequent war. Singer and Cusack (1981, pp. 415-17) also examined the impact of the outcome and cost of war on the question of addictive contagion. They found that high fatalities have a very slight prolonging effect, and that a high magnitude (measured in nation-months) has a very slight shortening effect though neither is statistically significant. For defeated states, however, wars costly in fatalities result in a longer interval until the next war, which is consistent with the war-weariness hypothesis. Garnham (1983, p. 11) confirmed that there is no relationship between the cost of war and the time until the next war, but argued that evidence in support of the war-weariness hypothesis is somewhat stronger (though not significant) for democratic states. He concluded, however, that "neither earlier empirical work nor [his] analyses confirm the war weariness hypothesis" (Garnham, 1983, p. 11). Finally, in a study that examined the contagious impact of a nation's threats to use military force as well as actual use of force, Bremer (1982, pp. 51-52) concluded that "the resort to force, or the threatened use of force, by nations does not appear to be addictive."

The mixed results of empirical studies of war contagion highlight the complexity of contagion hypotheses and suggest that further work is necessary to resolve the question of the net effects of contagion. Given our focus on war-weariness and other mechanisms by which a state's war involvement affects its subsequent war behavior, the national level of analysis is the appropriate one. Systemic-level findings incorporate infectious as well as addictive processes and thus have no direct implications for war-weariness or other forms of national contagion. Although there appear to be no net contagion effects at the systemic level, it is entirely possible that war is positively addictive for some states and negatively addictive for others. The following analysis will have direct bearing on this possibility.

One unique aspect of this study will be its focus on the contagious effect of war between the great powers, or great power wars. The great powers are the most important states in the system in terms of the systemic consequences of their actions (Keohane, 1969; Waltz, 1979; Levy, 1983); their general behavior may be distinct from that of other states; great power wars are particularly likely to induce weariness because of their seriousness; and the addictive contagious effects of great power wars on their participants have not been investigated previously. Singer and Cusack (1981) and Garnham (1983) each looked at wars involving great powers but not at the distinctive class of wars between the powers. One reason for the failure of

most contagion studies to examine the contagion of great power war is because adequate data are not widely available. The Singer and Small correlates of war data begin in 1816 and incorporate fewer than ten cases of great power war, too few to examine contagion effects with confidence, even for a national-level study. One of the strengths of Levy's (1982b) study is that by covering five centuries of international history it permitted a more thorough analysis of the contagion of great power war, but its relevance to the contagion of national war behavior is limited by its systemic-level focus.

This study aims to build on earlier work by focusing specifically on the phenomenon of addictive contagion in great power war behavior. It will attempt to answer the question of whether the net contagious effects of a state's war involvement are to increase or decrease the likelihood of its involvement in a subsequent war. These net effects reflect the interaction of numerous distinct contagious processes, but these processes are too complex and their data requirements too stringent to permit an empirical analysis of the distinct causal mechanisms involved.

### **Research Design**

Our study is organized around several specific hypotheses, each of which represents a different operational perspective on the general proposition that war inhibits subsequent war. The first hypothesis is that a state's participation in one war reduces the likelihood that it will become involved in a subsequent war in the period immediately following the first war. The second hypothesis is that the greater the seriousness of the first war, the greater the inhibition against subsequent war. The third hypothesis, reflecting the possibility that it is not an individual war but instead a series of wars over a relatively short period that induces an inhibition against subsequent war, is that the higher the frequency of war in one period, the lower the frequency of war in the following period.<sup>4</sup>

Given the focus on the contagion of great power wars over several centuries, the analysis will begin in 1500, the approximate origins of both the modern great power system (Levy, 1983, chap. 2) and the modern global system (Modelski, 1978). This extended temporal domain will incorporate a large number of great power wars and will therefore permit an aggregate data analysis of their contagion effects. The diversity of conditions subsumed by this five century span will also allow the generalization of empirically based findings on contagion beyond the particular historical circumstances of the nineteenth and twentieth centuries. Given the nature of our temporal partitioning, the analysis will cover 475 years,

<sup>4</sup> It should be emphasized that while these hypotheses are stated in the form of negative addictive contagion, this analysis is equally open to the possibility of positive addiction.

to 1975. The identity of the great powers over this period is taken from Levy (1983, chap. 2).<sup>5</sup>

This study investigates the contagious effects of great power war, the occurrence of which essentially serves as the independent variable. The question now is what classes of wars should be taken as evidence of these contagion effects. The war-weariness hypothesis suggests that long and costly great power wars should inhibit not only other great power wars, but also less serious wars. The standard 1,000-battle-death criterion suggested by Singer and Small (1972) and widely adopted sets too high a threshold. It would exclude from the data too many lesser conflicts that should be inhibited by the weariness induced by earlier great power war, and which therefore must be included in the analysis as data bearing on contagion hypotheses. For the same reason, the analysis must not be restricted to interstate wars. As suggested by references to the post-Vietnam inhibitions against American intervention in the Third World, military activity on the "periphery" of the system, removed from the central European core, should also be included. For the pre-1945 period, this means that the occurrence or nonoccurrence of imperial and colonial wars must also be considered as evidence relevant to addictive contagion hypotheses. Separate analyses will be conducted for the effects of contagion on all wars and on great power wars.

The data on great power war for the 1500–1975 period are taken from Levy (1983). For the dependent variable, however, which includes imperial wars and smaller European wars, existing compilations of war data are not adequate. The revised Small and Singer (1982) data only go back to 1815; the Wright (1965) and Sorokin (1937) data are not based on systematic criteria and contain numerous inconsistencies; and Levy (1983) excluded imperial wars and smaller European wars. Thus a new data set of international wars involving the great powers must be generated. Interstate and imperial wars involving the great powers during the post-1815 period have been taken from the revised Small and Singer (1982) lists of interstate and extrasystemic wars, with some modifications. Richardson (1960a), Langer (1972), and Dupuy and Dupuy (1977) have been consulted for the inclusion of imperial wars and other wars involving less than 1,000 battle deaths but significant hostilities nevertheless. For the pre-1815 period, a combination of the Wright (1965), Sorokin (1937), and Woods and Baltzly (1915) data sets are used. While these are individually unreliable, together they provide

<sup>5</sup> The great powers include France, 1500–1975; England/Great Britain, 1500–1975; Austrian Hapsburgs/Austria/Austria-Hungary, 1500–1519, 1556–1918; Spain, 1500–1519, 1556–1808; Ottoman Empire, 1500–1699; United Hapsburgs, 1519–56; the Netherlands, 1609–1713; Sweden, 1617–1721; Russia/Soviet Union, 1721–1975; Prussia/Germany/West Germany, 1740–1975; Italy, 1861–1943; United States, 1898–1975; Japan, 1905–45; China, 1949–75.

mutual validity checks. Any war listed in two of these is included in our compilation. Cases involving single-source wars are resolved by reference to Dupuy and Dupuy (1977) and Langer (1972). These two references are also important sources for the identification of imperial wars, which are only sporadically included in our main sources. Further ambiguities are resolved with reference to standard historical sources such as *The New Cambridge Modern History* (1957), Mowat (1928), and Hill (1914).<sup>6</sup>

The war-weariness hypothesis and other hypotheses of negative addiction suggest that contagion is a function not only of the incidence of war but also of the seriousness of war, with longer and more costly wars expected to have a stronger contagion effect. The length or duration of war for each great power is defined in terms of elapsed time from beginning to end and is measured in years. The severity of war for each great power is measured in battle deaths and is the best indicator of the human cost of war. A third dimension of the seriousness of war is its extent or number of participating great powers. Finally, a state's total number of battle deaths may be less significant than its yearly average during a war; this severity/duration ratio will be referred to as the concentration of war. The data on these dimensions of great power war are taken from Levy (1983). Since hypotheses of negative addiction put far more emphasis on inhibitions against the outbreak of subsequent war than on the seriousness of the wars that might occur, the dependent variable will be measured only by the incidence of war and the elapsed time from the termination of one war to the onset of another.

As emphasized, each of the hypotheses will be tested at the national level. This will involve two sets of analyses. First, the national war behavior of all great powers will be aggregated and analyzed. The focus of this aggregate-level analysis is on the great power role without regard for the identities of particular powers. Each great power war will generate  $n$  cases, where  $n$  is the number of powers participating in the war, and the duration, severity, and concentration of the war will be distinct for each participant. Next, the analyses will be conducted separately for each great power in order to determine whether the aggregate pattern holds individually for each of the great powers in the system. If the aggregate patterns hold for each of the individual great powers, our confidence in their validity would be enhanced.<sup>7</sup>

<sup>6</sup> See Levy and Morgan (1984) for further discussion of this data set.

<sup>7</sup> Patterns of contagion for individual great powers also have bearing on hypotheses regarding the determinants of contagion. Similar patterns could be explained by the nature of the system or great power role. Significantly different patterns of contagion for individual powers would suggest, however, that national-level variables or the unique environments of individual powers are important sources of addictive contagion.

## Data Analysis

### *The Distribution of Interwar Intervals*

The central prediction of the war-weariness hypothesis and other hypotheses of negative addictive contagion is that war induces an inhibition against war and thus reduces the likelihood of subsequent war. It follows that the time interval between wars would be greater than if war-weariness were absent. This hypothesis can be tested directly by comparing the observed distribution of elapsed times between wars with the theoretical distribution that would be expected in the absence of war-weariness or other forms of contagion. In the absence of contagion or other extraneous influences, wars would occur randomly over time. We know from probability theory that random events follow a Poisson distribution, and that the time intervals between random events follow an exponential distribution.<sup>8</sup>

In the presence of war-weariness the distribution of time intervals between wars would deviate from the exponential distribution in one of three ways. First, the distribution could have the same exponential shape but be shifted to the right, reflecting a short-term "dead time" induced by contagion before the normal pattern is resumed. Alternatively, the shape of the distribution could change in such a way that a significant proportion of the area under the curve shifts to the right, reflecting a shift in the likelihood of war from the short-term to the long-term period after a great power war. Finally, the distribution may be altered in both ways.

The actual distribution of elapsed times between a great power war and the subsequent war is presented in Figure 1, and that for the time to the next great power war in Figure 2. These data represent the combined results for all great powers, aggregated over ten-year periods.<sup>9</sup> The observed data certainly appear to conform to the exponential distribution predicted by our null hypothesis of no contagion. This can be confirmed by a  $\chi^2$  goodness-of-fit test, based on a comparison of the observed and expected distributions. The theoretical distribution of intervals between random events can be calculated from the probability density function of the exponential

<sup>8</sup> This is the basis of queuing theory (Wadsworth and Bryan, 1960) and waiting time analysis (Mood, Graybill, and Boes, 1974).

<sup>9</sup> Since our focus is on war-weariness, we analyze only those wars occurring after the first war has terminated. This excludes 54 cases of war and 26 cases of great power war which occur while the first great power war is under way. For this reason the number of great power war cases in Table 1 exceeds the number of all war cases.

This analysis was also performed using one- and five-year periods of aggregation with virtually identical results. The ten-year periods are presented to simplify the visual presentation and to "smooth" the downward curves.

FIGURE 1  
Distribution of Interwar Intervals after Great Power Wars

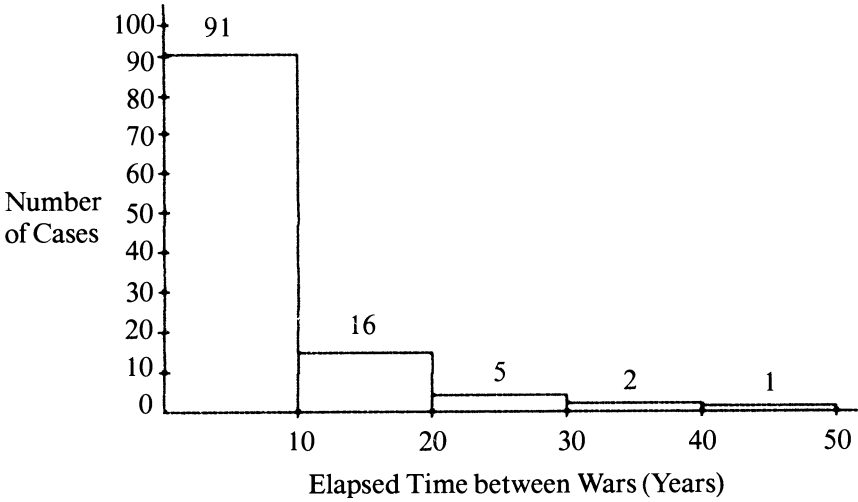


FIGURE 2  
Distribution of Elapsed Times between Great Power Wars

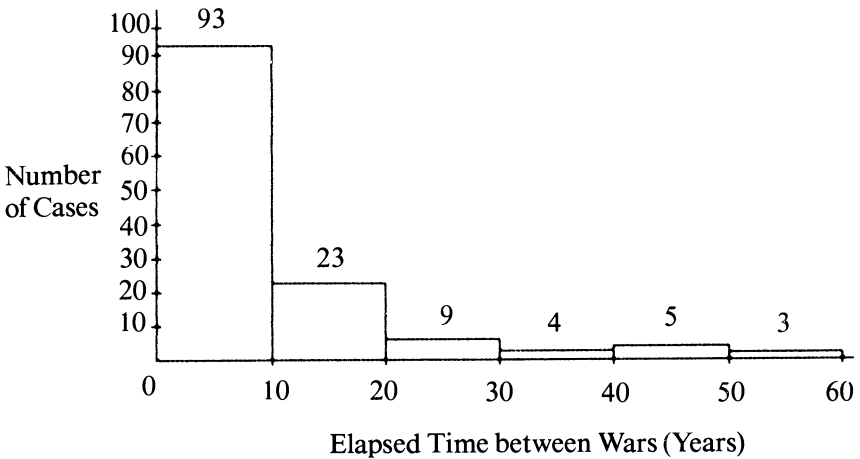


TABLE 1

Observed and Expected Frequencies of Elapsed Times between Wars

All Wars			Great Power Wars		
Elapsed Time (years)	Observed	Expected	Elapsed Time (years)	Observed	Expected
1-10	91	86	1-10	93	84
11-20	16	22	11-20	23	33
≥21	8	7	21-30	9	12
			≥31	12	8
$\chi^2 = 2.069; df = 2; p > .3$			$\chi^2 = 5.99; df = 3; p > .1$		

distribution,  $f(t) = \lambda e^{-\lambda t}$ , where  $1/\lambda$  is the mean time between events. The observed and predicted distributions of elapsed times, for subsequent wars and for great power wars, are presented in Table 1, along with the  $\chi^2$  statistics and their associated  $p$  values. Neither of the  $\chi^2$ 's are statistically significant at .10, so that the null hypothesis cannot be rejected. There is no evidence of the effects of any war-weariness on wars in general or on great power wars. Moreover, Table 1 indicates that to the extent that the observed distributions deviate at all from the expected exponential distributions, there are *more* instances of relatively short time intervals than would be expected for random events. While these findings are not sufficiently strong to support the hypothesis of positive contagion, they do unambiguously contradict the war weariness hypothesis.<sup>10</sup>

An alternative test is to examine the probability of war as a function of the number of years since the last war. Here the probability is calculated from the following ratio: the numerator is the number of times the first subsequent war occurs  $t$  years after an earlier great power war, and the denominator is the total number of times the first subsequent war occurs  $t$  years or more after the earlier great power war. For example, we have

<sup>10</sup>These analyses were also performed using five-year periods of aggregation and for the pre- and post-1815 period separately. In every case the results were consistent with those presented here. Of the ten additional tests, in only one did  $\chi^2$  approach statistical significance. For the entire period, using a five-year period of aggregation, the distribution of the elapsed time until the next great power war was significant at  $p < .10$ . The only category in which the observed frequency was greater than the expected frequency was the first five-year period. But this, once again, is the direct opposite of what the war-weariness hypothesis would predict.

Analyses of this type performed separately for Britain and France produced identical patterns. The number of cases for each of the other great powers is too small to provide meaningful results, however.

initially 115 cases of great power war endings. In 13 of these cases the first subsequent war occurred in the first year after the great power war, or a proportion of .11. There remain 102 cases for which the first subsequent war involvement could occur in the second year and in 14 (or .14) of these cases such a war did break out leaving 88 cases for the third year, and so on. Whereas the war-weariness hypothesis would predict that the probability of war is lowest in the period immediately after the first war, the null hypothesis predicts that this probability is constant over time.<sup>11</sup> Consequently, in the absence of war contagion the probability of first subsequent war involvement should be independent of the number of years since the end of the previous war, so that the proportion of cases characterized by new war involvement should remain constant across time.

The results of such a test are pictured in Figure 3. Notice that at the point of 20 years since the previous war we have specified the proportion of cases having a new war as an annualized rate for the 20th through 48th (the last case) years combined. This was necessary because beyond the 20th year the number of cases is so small that the proportion of cases having a new war is either .00 or very high (the proportion for the last case will be 1.00). Our hypothesis can be tested by applying least squares regression analysis to these data. The regression coefficient of  $b = -.001$  ( $p = .68$ ) clearly suggests that probability of new war involvement changes very little with the number of years since the last war.<sup>12</sup> These results are fully consistent with those of our other tests in showing that there is no confirmation for any hypothesis suggesting the addictive contagion of great power war.<sup>13</sup>

#### *The Effect of the Seriousness of War on War-Weariness*

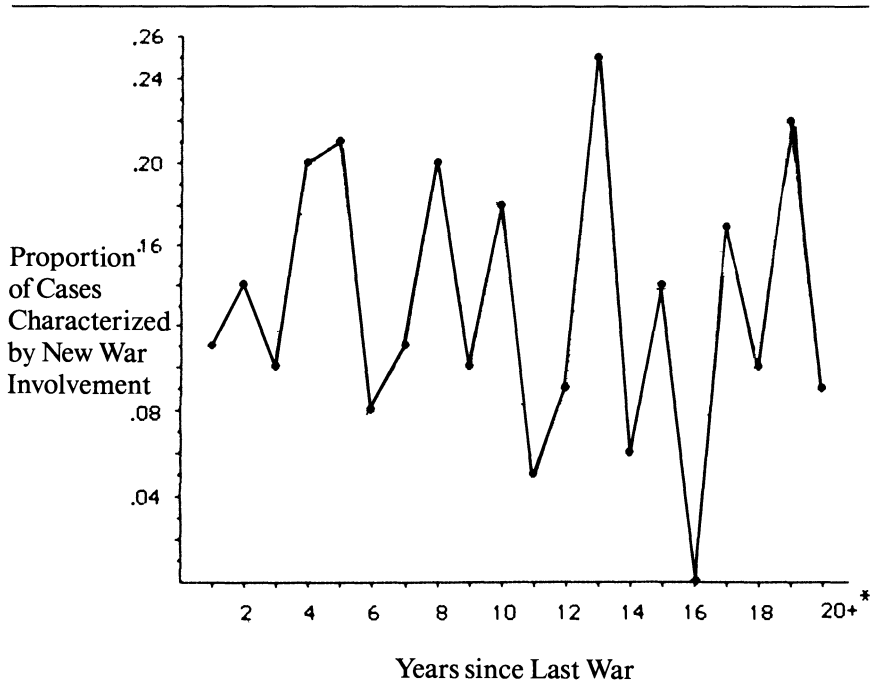
Having found no evidence of negative addiction in general or war-weariness in particular in the period immediately following a great power war, let us now consider the proposition that war-weariness is an increasing function of the seriousness of the war. This relationship can be examined by a simple correlation analysis between the indicators of the seriousness of the first war and various measures of the incidence of the second war. The indicators of seriousness defined earlier are duration, extent (number of participating great

<sup>11</sup> Note that the exponential model of elapsed times between random, noncontagious events is also based on the assumption of constant probabilities of events, and in this sense the tests are similar.

<sup>12</sup> A similar analysis was performed treating the proportion of cases characterized by a new *great power war involvement* as a function of the number of years since the previous war. In this case the regression coefficient was  $b = -.0004$  ( $p = .865$ ), which is also evidence against any hypothesis of war contagion. If the analysis is conducted with the final data point (representing the annualized rates for combined years) excluded, the results are nearly identical ( $b = -.0006$  for all wars and  $b = -.0005$  for great power wars).

<sup>13</sup> Note that the negative regression coefficient, however small, is in the opposite direction as that predicted by the war-weariness and other hypotheses of negative addictive contagion.

FIGURE 3  
Frequencies of War as a Function of Years since the Last War



\*Annualized rates for combined years.

powers), severity (log (battle deaths)), and concentration (log (battle-deaths per year)). The dependent variable will be the number of wars (and great power wars) occurring in the five-year period following the end of a great power war, and the elapsed time until the next war (and great power war). The resulting product-moment correlation coefficients are presented in Table 2.

There appears to be no meaningful relationship between the seriousness of great power war and the outbreak of subsequent war. None of the correlation coefficients exceeds .24, indicating that none of the war indicators accounts for more than 6 percent of the variance in the subsequent outbreak of war, and only two exceed .20. While many of the coefficients are in the same direction as predicted by the war-weariness or other negative addiction hypotheses, only three are statistically significant, and these appear to follow no meaningful pattern. It is interesting that the severity of war, which in theory should have the greatest immunizing effects, appears to have the least, with its coefficients being smallest on average and none

TABLE 2  
Correlations (*r*) between War Indicators and Measures of  
Subsequent War, Aggregated for All Great Powers

Indicators of Subsequent War	War Indicators <sup>a</sup>			
	Duration	Extent	Severity	Concentration
Number of wars within 5 years	-.08	-.20	-.02	-.03
Number of great power wars within 5 years	.01	-.24	-.02	-.07
Elapsed time to next war	-.11	.12	-.02	.13
Elapsed time to next great power war	-.07	.10	.09	.21

<sup>a</sup>The indicators of the first war are, respectively, duration, extent, number of participating powers, severity (battle deaths), and concentration (battle deaths per year). The logarithmic transformations of the severity and concentration indicators are used. The italicized coefficients are statistically significant at the .05 level.

being significant. It is seen that the results are roughly the same regardless of whether all wars or great power wars are used as the dependent variable. It can be concluded that the coefficients are far too weak to support the hypothesis that the more serious the great war, the greater the inhibition against subsequent war.

These results are confirmed if we examine the coefficients for individual great powers.<sup>14</sup> Of the 112 coefficients for France, England, Spain, Austria, Turkey, Russia, and Prussia/Germany, only 9 are statistically significant at .05, and 4 of these point to positive addiction rather than to war-weariness. Most of the coefficients are relatively small, and only about half are in the predicted direction. The results are mixed both for individual states and for specific indicators. The coefficients for the elapsed time indicators often point in the opposite direction from these for the incidence of war during or after a previous war, and the indicators for all wars are often opposite from the indicators for great power war. The contagion effects of the duration of war are positive for some states (Austrian Hapsburgs), negative for others (Prussia), and mixed for the rest. Most of the patterns have no obvious theoretical explanations. Differences across indicators for a given power are as large as differences between powers. The coefficients are

<sup>14</sup>The analysis of individual powers is restricted to seven states, for only they provide a sufficient number of cases to permit us to generalize about the contagion in their war behavior. Each state included was in the system for at least 200 years and was involved in at least nine great power wars, whereas each state excluded was in the system for at most 105 years and (except for the United Hapsburgs, 1519-56) was involved in no more than seven wars.

so small that their directions are highly unstable. For these reasons we must conclude that the contagion effects of great power war are basically independent of the seriousness of the war.<sup>15</sup>

To this point we have found that there is no evidence that war has any contagious effects on its participants, except that the likelihood of a second great power war may be *increased* slightly, directly contrary to hypotheses of war-weariness and other forms of negative reinforcement. In addition, longer, more extensive, more severe, and more highly concentrated wars are no more contagious for their participants than less serious wars, and general wars are no different in their addictive contagious effects than other great power wars. The question that remains is whether the incidence of war might be affected not by the existence or seriousness of a single preceding war, but instead by a series of earlier wars.

#### *The Contagious Effects of a Series of Wars*

The question here is whether the frequency of a great power's wars in one period has any impact on the frequency of its wars in the following period. War-weariness and other forms of negative addictive contagion would predict a negative relationship. A ten-year period of aggregation is examined in order to capture short-term contagion effects but exclude intermediate-term cyclical phenomena, and a product-moment correlation coefficient is used as the measure of association. The results, including an aggregate measure for all great powers as well as the coefficients for individual powers, are presented in Table 3. Great powers in the system for less than a century or so are excluded from the table and from the individual (but not aggregate) analyses.

If the national war behavior of all states is aggregated, we find a small

<sup>15</sup> It is conceivable that the relationship between the seriousness of war and the degree of contagion is not linear, but instead involves a threshold effect—once the seriousness of war reaches a certain level, war-weariness and therefore a period of relative peace is induced. This hypothesis can be tested by examining the effects of general or hegemonic wars. These conflicts involve nearly all of the great powers and largely determine the structure and transformation of the international system. Because of their high severity and length, they should be most likely to induce war-weariness and other forms of negative addiction. For a definition of general war and list of the ten general wars since 1500, see Levy (1985).

Whether general wars have distinctive contagion effects is determined as follows. Difference of means tests are used to compare general wars with the great power wars examined earlier (with general wars removed from the latter), using the following indicators of subsequent war: yearly number of wars and great power wars occurring within ten years, and elapsed time to the next war and great power war. If the results are aggregated over all states we find that the differences are all in the predicted direction but are very small, with only one of the four being statistically significant at .05 and the other *p* values being relatively high. The results for the individual great powers are similar and support the conclusion that general wars have no distinctive contagion effects, though these findings must be treated with caution because of the small number of cases.

TABLE 3  
Correlations (*r*) between Frequencies of  
Great Power War and Subsequent War

	Ten-Year Periods	
	All War	Great Power War
Aggregate ( <i>n</i> =266)	-.10	.06
France ( <i>n</i> =47)	.03	.07
England ( <i>n</i> =47)	-.37	.00
Spain ( <i>n</i> =26)	-.25	-.27
Austrian Hapsburgs ( <i>n</i> =37)	-.15	-.10
Ottoman Empire ( <i>n</i> =20)	-.07	-.03
Russia ( <i>n</i> =24)	-.16	.05
Prussia/Germany ( <i>n</i> =23)	-.11	.11

NOTE: Coefficient in italics is statistically significant at .05 level.

negative relationship between the frequency of a great power's wars during one period and its frequency of wars during the following period, and a very small positive relationship involving the frequency of great power wars in the following period. These relationships are very weak, however, with the frequency of great power war explaining at most 1 percent of the variance in the frequency of subsequent war.<sup>16</sup> It is interesting that great power wars tend to inhibit, however slightly, the occurrence of subsequent war but tend to increase slightly the incidence of great power war.

This conclusion is supported by an analysis of the individual great powers. There is a negative relationship between the frequency of great power war in one period and the frequency of war in the following period for all but one of the powers, but these relationships are all very weak except for the case of England. The war-weariness hypothesis would predict more strongly negative contagion effects on subsequent great power wars, but Table 3 shows that this is not the case. There are more positive than negative coefficients, but these are far too small to be substantively meaningful. Nor do there appear to be any obvious patterns for individual states. England's significant negative relationship involving all wars vanishes for great power

<sup>16</sup> The absence of a relationship involving the frequencies of great power wars in successive periods is confirmed by a Durbin-Watson test for autocorrelation. If the frequency of great power war is regressed against time, an analysis of the residuals generates a Durbin-Watson coefficient of  $d=2.03$ , which falls within the range of no serial correlation (Ostrom, 1978, pp. 32-34; Yamane, 1973, p. 1096). The coefficient for all wars has a fairly low  $p$  value of .054, but this is due in part to the large number of cases involved (an aggregate total of 266 ten-year periods).

wars. There appears to be some negative reinforcement for both types of wars in the case of Spain, but neither of the coefficients is statistically significant and in neither case can this explain more than 8 percent of the variance in the frequency of subsequent war.

On the basis of this analysis we must conclude that a great power's involvement in several wars with other great powers in one period has no effect on its likely frequency of war involvement in the following period.<sup>17</sup> Taken together, these analyses suggest that the historical evidence contradicts hypotheses of negative addictive contagion but is not strong enough to support hypotheses of positive addiction.

### *The Stability of the Findings over Time*

One potential problem with the analyses performed to this point is that the finding of no war contagion may not be constant over the entire five-century span of the modern great power system. For example, if we make the plausible assumption that the impact of societal variables has increased over the last five centuries (Howard, 1976; Osgood, 1967), then we should expect that the existence of war-weariness and its impact on war behavior have been increasing over time. If this (or some other mechanism) has altered the impact of contagion processes, it is possible that our finding of no contagion is masking a true relationship of negative contagion in the more recent historical era and positive (or no) contagion in the earlier years of the great power system.<sup>18</sup> Our concern regarding this potential problem of time-associated spuriousness is deepened by the fact that the frequency of war is considerably lower in the more recent period (Levy, 1982a). In order to control for any such spuriousness associated with time, we will repeat several of our analyses separately for the periods before and after 1815.<sup>19</sup>

First consider the question of whether a series of great power wars has any impact on the frequency of war or great power war in the following period. If we aggregate the war behavior for all great powers in each ten-year period, we get a total of 178 national ten-year periods before 1820 and 88

<sup>17</sup> The results of this analysis are no different if a 20-year period of aggregation is used.

<sup>18</sup> This problem is well known by those familiar with the studies produced by the Correlates of War Project. In a number of cases, variables that are uncorrelated over the entire period are moderately correlated (but in opposite directions) in the nineteenth and twentieth centuries (see, for example, Singer and Small, 1968; Singer, Bremer, and Stuckey, 1972).

<sup>19</sup> The date 1815 is used because it is the beginning point for most quantitative studies of contagion (since the Singer-Small data begin in 1816), because it represents the most obvious turning point in most indicators of great power war (Levy, 1983, chap. 6), and because it is often taken as the beginning of the period of modern democratic states (so that changes in societally induced war-readiness should be most readily detected at this point). For purposes of convenience in the temporal aggregation of the data, the year 1820 rather than 1815 is used, but this has no effect on the identity of the wars included in the study.

national ten-year periods for the 1820–1970 period.<sup>20</sup> The correlation between the frequency of great power war in one ten-year period and the frequency of all wars in the following ten-year period is  $r = -.07$  for the 1500–1820 era and  $-.12$  for the 1820–1970 era (versus  $-.10$  for the 1500–1970 era). Similarly, the correlations involving subsequent great power war are  $r = .06$  for the earlier era and  $-.15$  for the more recent era. Each of these coefficients is relatively small, and none is statistically significant at the .05 level. While the coefficient for each type of war is slightly more negative for the period since 1820, the differences are too small to be meaningful, particularly given the relatively few independent cases for the recent period. It can be concluded, therefore, that the absence of contagion effects from a series of great power wars remains basically unchanged during the five-century span of the modern system.

Another comparison of the periods before and after 1815 can be made with respect to the hypothesis that the more serious a war, the greater its negative addictive effects. The same indicators are used as previously, and the aggregate results for all great powers are presented in Table 4. For most of the pairs of indicators the differences between the correlations for the periods before and after 1815 are relatively small. If we focus on the number of wars or great power wars occurring within five years of a great power war, or the elapsed time to the next war, we see that 11 of the 16 pairs of coefficients differ by .10 or less, suggesting the absence of significant changes over time. It is particularly interesting that the correlations involving the elapsed time indicators suggest a tendency for a slight negative addiction in the pre-1815 period to be replaced by a slight positive addiction in the last century and a half. This is the opposite of the increasing war-weariness or negative reinforcement that would be predicted by the war-weariness hypothesis on the basis of the increasing democratization of political systems and the presumed increase in the impact of societal variables on state behavior. Note also that the indicator for which these tendencies are most pronounced is not the severity or concentration of war for a particular state, as the war-weariness hypothesis would predict, but instead the total number of great powers involved in the war.

If we repeat our analysis of the distribution of elapsed times between wars for each of these periods using a  $\chi^2$  goodness-of-fit test between the observed data and the theoretical exponential distribution predicted by the

<sup>20</sup>Note that the 88 ten-year periods since 1820 are somewhat misleading, and do not represent 88 truly independent cases. Due in part to infectious contagion, nearly 40 percent of all great power involvements in great power wars since 1820 consist of the experiences in the two world wars. The fact that they do not occur in adjacent periods produces a negative bias in the resulting correlations.

TABLE 4  
Correlations ( $r$ ) between War Indicators and Measures of  
Subsequent War, for Periods before and after 1815

Indicators of Subsequent War	War Indicators <sup>a</sup>			
	Duration	Extent	Severity	Concentration
Number of wars within 5 years				
Pre-1815	-.12	-.21	-.00	.03
Post-1815	-.07	-.11	-.04	-.04
Number of great power wars within 5 years				
Pre-1815	-.09	-.23	-.00	.04
Post-1815	-.02	.01	.08	.11
Elapsed time to next war				
Pre-1815	-.07	.22	-.03	.03
Post-1815	-.21	-.15	-.06	.08
Elapsed time to next great power war				
Pre-1815	.06	.30	.17	.17
Post-1815	-.31	-.46	-.12	-.00

NOTE: There are about 130 cases prior to 1815 and about 40 cases afterward. The italicized coefficients are statistically significant at the .05 level.

<sup>a</sup>The indicators of the first war are, respectively, duration, extent, number of participating powers, severity (battle deaths), and concentration (battle deaths per year). The logarithmic transformations of the severity and concentration indicators are used.

null hypothesis, we find no significant differences in contagion over time. For the elapsed time between great power war and subsequent war aggregating the elapsed times by five-year periods, we find that  $\chi^2$ 's are about 2.5 and both  $p$  values are about .4 to .5 for the periods before and after the Congress of Vienna.<sup>21</sup>

Taken together, these different statistical tests suggest that there is no systematic evidence pointing to significant changes in the patterns of addictive contagion over time. There is no reason to believe that our general conclusion of the absence of addictive contagion masks a pattern of positive contagion in one period and negative contagion in another, and thus no reason to question the validity of our findings for the entire 1500-1975 period.

<sup>21</sup> An analysis of the elapsed times between *great power wars* for the pre-1815 period gives a  $\chi^2$  of 9,  $p > .1$ , compared to  $p > .5$  for the later period. The main deviation from the theoretical exponential distribution, however, is the greater number of very short elapsed times, directly contrary to the war-weariness hypothesis.

### Conclusion

The war-weariness hypothesis holds that a state's involvement in war, and particularly long and destructive war, reduces the likelihood of its involvement in subsequent wars for a certain period of time. This empirical study of war contagion differs from earlier ones in several key respects. It focuses exclusively on the addictive contagion effects of wars between the great powers; it analyzes whether the hypothesized negative addictive contagion inhibits imperial wars as well as interstate wars involving the great powers; it examines the hypothesis over the full five-century span of the modern system; and it examines the hypothesis for each of the great powers individually as well as for the aggregate national-level behavior of all of the great powers combined. We have examined the impact on contagion of various dimensions of the seriousness of war in addition to its incidence or frequency. Finally, we have examined possible changes in patterns of contagion over the five-century span of the modern system.

The results have been relatively consistent, regardless of precisely how the hypothesis is operationalized. After being involved in a war with another power, a great power tends to be no more likely to become involved in another war or great power war. If anything, there is a short-term increase in the likelihood of war, but this tendency is not sufficiently strong to provide conclusive support for a positive reinforcement hypothesis. If the time intervals between wars are examined, the data conform fairly well with the exponential distribution associated with the null hypothesis of random events with no contagion. Moreover, any deviations from the expected theoretical distribution are in the direction of positive addiction. The probability of war is independent of the period of time since the last war. In addition, the hypothesis that more serious wars generate a greater inhibition against subsequent war (or great power war) is not supported by the evidence, and general wars involving nearly all the great powers are no different in their contagious effects than the average great power war. Finally, there is no support for the hypothesis that a series of great power wars induces an inhibition against subsequent war. These conclusions of the absence of negative contagion in general and war-weariness in particular hold for the individual great powers as well as for the aggregate of all national great power war behavior. There appear to be no distinctive and consistent patterns involving individual great powers, but because of relatively small  $n$ 's it is difficult to generalize. There is no consistent evidence of any significant changes in these patterns of contagion over the five century span of the system.

These findings of the absence of war-weariness are consistent with a wide range of empirical studies on contagion in the outbreak of war. They

confirm other national-level studies which find no convincing evidence of addictive contagion (Singer and Small, 1974, pp. 283–84; Singer and Cusack, 1981; Garnham, 1983; Bremer, 1982, pp. 51–52), and extend these earlier findings by demonstrating their validity for great power wars and for the entire span of the modern system. By examining the addiction hypothesis for individual great powers as well as for the aggregation of all national great power behavior, this study also has some relevance for earlier systemic-level studies of contagion, which generally find no contagion in the outbreak of war (Richardson, 1960b, pp. 128–31; Singer and Small, 1974, pp. 278–82; Singer and Cusack, 1981; Levy, 1982b). One possible explanation for the absence of systemic-level contagion is that war may be positively contagious for some states and negatively contagious for others, but this study has found no clear and consistent evidence in support of such a proposition.<sup>22</sup> Instead, the more likely explanation is either that there are no contagion effects of any kind, that multiple but opposing contagion effects cancel each other out, or that under some conditions war is positively contagious while under other conditions it is negatively contagious. The testing of these alternative explanations would be a potentially useful avenue for subsequent research.

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<sup>22</sup> This finding should be regarded as tentative until it is confirmed by subsequent research.

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