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# Butcher's Bills: Engagement-level preponderance and casualties in the French Revolution Wars and Napoleonic Wars, 1792–1815

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**Abstract:** This article reports findings from an empirical investigation of the generalization captured in the aphorism that 'god is on the side with the biggest battalions.' Departing from the focus on major or decisive battles in previous studies, this quantitative analysis using ordered logit and ordinary least squares regression of two data sets of 945 and 823 large, medium and small engagements between the armies of France and its enemies during the Wars of the French Revolution and Napoleonic Wars from 1792 to 1815 reveals that a preponderance of numbers was positively associated with victory but also higher casualties.

**Keywords:** Napoleon Predominance in Numbers Decisive Battle Attrition Casualties

## 1 Introduction

The generalisation that larger numbers prevail over smaller numbers is probably as old as warfare.[1] Different versions of the cynical aphorism that 'god is on the side with the biggest battalions' have been attributed to Voltaire and Napoleon Bonaparte,[2] though Marie de Rabutin-Chantal, marquise de Sévigné, wrote that 'fortune is always on the side of the biggest battalions' decades before either the philosopher or the Emperor.[3] The marquise was discussing the 1673 Battle of Khotyn that took place on 22 December, in which the army of Polish Hetman and future Grand Duke of Lithuania and King of Poland John Sobieski defeated the army of Ottoman Pasha Hussain. Whether correct or incorrect about that battle in particular, the intuitively appealing generalisation is significant for our understanding of individual armed engagements and the conflicts they comprise.[4] Does deploying more soldiers actually make victory more probable? What is the effect of deploying more soldiers on casualties? This article addresses these questions with an empirical analysis of the engagements large, medium and small during the French Revolution Wars and Napoleonic Wars from 1792 to 1815.

Unlike previous studies, this research focuses not just on decisive or major battles but on all of the engagements on land during these conflicts, including minor battles, sieges, clashes, retreats, raids and skirmishes. Major battles tempt scholars as well as soldiers to deny or escape the grim truth that wars of manoeuvres as initially envisioned by one or both states in a conflict typically devolve into wars of attrition.[5] Properly defined as the gradual destruction of the enemy's capacity to wage war, war of attrition is the alternative to war of manoeuvre, which is defined by seeking decisive battle. Despite the ambition of decision-makers and the aspiration of bellicose publics, wars of manoeuvres typically devolve into wars of attrition. Unfortunately, misplaced focus on major

1 Keeley, L. H. (1996). *War before Civilization: The Myth of the Peaceful Savage*. Oxford University Press, New York, p. 81.

2 Kirkpatrick, D. L. (2021). *How Important are Superior Numbers? A Reappraisal of Lanchester's Square Law*. Cambridge University Press, Cambridge, p. 5; Clark, S. (2013). Wearing away the stone: Assessing theories of combat attrition. *Comparative Strategy*, *32*(2), pp. 115-132, p. 116.

3 Lettre 118—De M^me^ De Sévigné a M^me^ De Grignan. *Lettres de Madame de Sévigné*. Firmin Didot, Paris, p. 1846.

4 The success of non-violent mass movements is also associated with the number of their participants. Beissinger, M. R. (2022). *The Revolutionary City: Urbanization and the Global Transformation of Rebellion*. Princeton University Press, Princeton, pp. 175-180.

5 Nolan, C. J. (2017). *The Allure of Battle: A History of how Wars have been Won and Lost*. Oxford University Press, Oxford, pp. 13-17.

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battles tends to obscure the importance of the numerous lesser engagements that were also part of the friction of war. Whatever other value strategists assign to victory or defeat in these lesser engagements, each one forms part of the larger calculus of success in war.

The data analysed in this study were drawn from the 1792–1815 French Revolution and Napoleonic Wars for two reasons. First, this was the advent of 'total war', a period in which states mobilised more of their available resources, especially potential manpower, for warfare. That helps to explain the role of Napoleon Bonaparte as a mythic figure so often evoked by proponents of decisive battle in wars of manoeuvres.[6] Their solution to overcoming the problem of stalemate or descent into war of attrition was the 'genius' comparable with that of 'God of War', as Carl von Clausewitz described Napoleon.[7] Second, the data were readily available for analysis from Digby Smith's chronological record of all of the engagements during the period. This research takes fuller advantage of that chronological record to generate cases for analysis than previous studies did.

Note that moving the focus of analysis from decisive battles to all engagements is not to dismiss the other important factors at play in warfare. Leadership, morale, weather, roads and terrain are all crucial. They are also difficult or impossible to quantify, and this is a quantitative analysis. Napoleon's extraordinary leadership stands out among the figures who led armies into battle in this period. Wellington famously equated the presence of Napoleon on the battlefield with an additional 40,000 troops.[8] That factor can be and is quantified in this analysis. However, the other battlefield commanders are simply too numerous and their roles too limited to permit comparable quantification. The evidence of troop morale is too anecdotal and too incomplete for quantification. Weather, roads and terrain, which are interrelated factors, are noted in detail for the handful of decisive battles in the period but not for many of the minor engagements. Future research might build on the quantitative findings reported here by incorporating historical meteorologic and geophysical data.

## 2 Historical context

Limited wars characterised warfare in 17th and 18th century Europe.[9] War aims were typically modest and did not include the occupation of enemy capitals, the imposition of new regimes, or the subjugation of the enemy population. Armies were smaller than those in previous centuries, in part because aristocratic elites feared the potential social, economic and political disorder of mass mobilisation. Enlisted ranks were recruited rather than conscripted, and rather than representative of the national population, were often foreigners, had low social status or were recruited from the peasantry around garrisons on the borders.[10] Position dominated war as monarchical regimes constructed lines of fortresses and fortified towns across borders to impede invasion.[11] Field battle was avoided in favour of sieges. Victories in the rare field battles were rarely fully exploited. Conservative monarchies sought to avoid the unintended consequences that either great victory or great defeat might yield.

In 1792, the French Revolution ushered in a new era of total war. Mass mobilisation via ideology and conscription now made annihilating an enemy – its army and even its government – thinkable and achievable. Decisive battle was now sought in what were planned to be wars of manoeuvre. The ambitious Napoleon Bonaparte anticipated and won short wars of manoeuvre early in his career[12] but saw his later, grander gambles decompose into wars of attrition. The ideologies contributing to the new intensification of war were republicanism and nationalism.[13] Republicanism challenged monarchism, and nationalism challenged dynasticism. Cabinet wars were replaced by national wars in which more of the state's resources – human and material – were invested in warfare. The heroic élan of French soldiers may have made them more willing to risk their lives than pay received by the professional soldiers of the monarchies they faced. What is certain is that it reduced the social barrier between civilian and military life to produce national armies motivated by patriotic duty.[14] The 1798 *loi Jourdan* expressed the idea with the extraordinary

**6** Nolan, p. 13.
**7** Nolan, p. 195.
**8** Esdaile. (2007), p. 221.
**9** Malkasian, C. (2002). *A History of Modern Wars of Attrition*. Prager, Westport, CT, p. 13.
**10** Lynn, J. A. (1996). *The Bayonets of the Republic: Motivation and Tactics in the Army of Revolutionary France, 1791-1794*. Westview Press, Boulder, CO, p. 45.
**11** Nolan, p. 108.
**12** Lefebvre, G. (1969). *Napoleon: From Tilsit to Waterloo, 1807-1815*. Columbia University Press, New York, p. 312.
**13** Bell, D. A. (2007). *The First Total War: Napoleon's Europe and the Birth of Warfare as we Know it*. Houghton Mifflin, Boston, p. 9; Esdaile, C. (2007). *Napoleon's Wars: An International History*. Penguin Books, New York, pp. 118-119.
**14** Bell, p. 135; Isabella, M. (2023). *Southern Europe in the Age of Revolutions*. Princeton University Press, Princeton, NY, p. 57.

declaration that, 'Every Frenchman is a soldier and owes himself to the defense of the Fatherland'[15].

> "The essence of the mass army is its ability to maintain its size in the face of the rigors of war: the attrition exacted by the unhealthful conditions of the campaign, the temptation of individuals to desert, and the firepower of the enemy. Its second essential quality is that it can to a very large extent retain its "combat power". Replacements can be armed, trained, and organized rapidly so that they can be maneuvered over great distances and employed in engagements. Thus the recruits must arrive with a certain willingness to become soldiers, a certain educability, and a certain commitment to the outcome of the battle"[16].

Napoleon's battlefield successes and the liberal reforms imposed on occupied countries compelled great power rivals to modernise both their militaries and societies. 'By 1808, light infantry, usually organised along the very lines used by the French, formed a prominent feature of most European armies'[17]. Humiliating defeats at Jena and Tilsit at the hands of Napoleon ultimately persuaded even Prussia to modernise.[18] The army was nationalised, and the officer corps underwent professionalisation that also later engendered an extraordinary militarism.[19] Prussians became citizens, serfdom was abolished, previously closed professions were opened to the talented, including Jews, and taxes were equalised.[20]

Crucially, for this study of the effect of numbers at the level of the engagement, the armies of 1792 to 1815 were similarly attired and armed. Infantry comprised the vast majority of soldiers, and they marched into battle in unforms of vivid national colours to make them visible to one another amidst smoke-filled battles: French wore white, British were red, Russians wore Green, Bavarian wore sky blue, etc.[21] Soldiers wore shako headgear to make them appear taller and therefore feel more formidable.[22] Infantry were armed with smooth bore muskets and bayonets, cavalry with swords and lances and artillery with smooth bore cannon. Victory was decided by the firepower of infantry and artillery. Deploying more soldiers and more cannons meant a greater chance of prevailing in battle. 'Musket design and infantry training to fire in volleys discouraged soldiers from aiming when firing their weapons'[23]. The limited accuracy of their muskets, fired at an estimated rate of once per minute, probably tempted many soldiers to engage in agonistic rather than deadly fire, producing casualties only gradually.[24]

In different periods between 1792 and 1815, France would wage war against Austria, Britain, Denmark, Egypt (formally the Ottoman Empire), Naples, Papal States, Portugal, Prussia, Russia, Sardinia, Spain, Sweden, Switzerland, United Provinces, United States (undeclared), Westphalia and smaller German states. Most of France's enemies became allied or client states after being defeated. Then, as Napoleon's fortunes declined, many once again became France's enemies.

Revolutionary France did not initiate the hostilities that would bleed the continent from 1792 to 1815. Instead, Austria and Prussia, encouraged by Russia, provoked war with the new republic which had been weakened by political and social upheaval, 'motivated mainly by balance of power considerations'[25]. While the Teutonic great powers were occupied with punishing Revolutionary France, Russia sought territorial gains from the Polish-Lithuanian Commonwealth.[26] Russian armies would engage French armies in campaigns in Switzerland and Italy in 1799–1800, but it was not until 1812 that the armies of Tsar would prove crucial to defeating France.

Although the Revolutionary French Army performed poorly at first, that changed dramatically on 22 September, 1792 at the Battle of Valmy. Revolutionary propaganda spun that a major battle, in which 52,000 French under Gen. Charles-François Dumouriez defeated 34,000 Prussians under Charles William Ferdinand, Duke of Brunswick-Lüneburg and Prince of Brunswick-Wolfenbüttel, into a heroic myth.[27] French infantry sang revolutionary anthems while holding their ground against the Prussian infantry, but the 'heavy lifting' was performed by the artillery. By the end of 1792, France was at war not only with Austria and Prussia but also with much of the rest of Europe – Britain, the Netherlands, Piedmont, Naples and Spain – and also with its own monarchists. French armies fought and often lost battles in Belgium,

**15** Slocpol, T. (1979). *States and Social Revolutions: A Comparative Analysis of France, Russia and China*. Cambridge University Press, Cambridge, p. 198.

**16** Posen, B. R. (1993). Nationalism, the Mass Army, and Military Power. *International Security, 18*(2), pp. 80-124, p. 83.

**17** Gates, D. (2001). *Warfare in the Nineteenth Century*. Palgrave, New York, p. 35.

**18** Clark, C. (2006). *Iron Kingdom: The Rise and Fall of Prussia, 1600-1947*. Harvard University Press, Cambridge, MA, pp. 307, 327.

**19** Bell, pp. 252-253.

**20** Clark, p. 327-330; Bell, pp. 252-253.

**21** Nolan, pp. 149-150.

**22** Grossman, D. (1995). *On Killing: The Psychological Cost of Learning to Kill in War and Society*. Back Bay Books, Boston, p. 8

**23** Muir, R. (1998). *Tactics and the Experience of Battle in the Age of Napoleon*. Yale University Press, New Haven, CT, p. 76

**24** Grossman, pp. 10-11.

**25** Mearsheimer, J. J. (2001). *The Tragedy of Great Power Politics*. W.W. Norton, New York, p. 274.

**26** Mearsheimer, p. 275.

**27** Bell, pp. 131-138

northern France and Italy while winning them against a reactionary uprising in the Vendée.

International and domestic threats led the new revolutionary government first to supplement and then replace the distrusted professional army of the *ancien régime*, beginning with the levy of three hundred thousand on 24 February, 1793,[28] followed by the *levée en masse* on 16 August 1793. The intention was to overwhelm the new republic's enemies by the deployment of larger numbers.[29] French conscription is perceived to have 'revolutionised warfare' by military science scholars.[30]

Conscription exploited demographic advantage. France had a larger population from which to recruit or conscript soldiers than two of its four great power rivals: Prussia and Britain.[31] 'Specifically, in 1800, France (with a population of roughly thirty million) was 50% larger than Germany (with a little over twenty million) – and Germany, to boot, was not yet united'[32]. Although the population of Austria was as large as that of France and the population of Russia even larger, their populations were subjects rather than citizens.[33] 'Russian serfs and Austrian and Prussian peasants were at a grave psychological disadvantage when pitted against the children of the French Revolution'[34]. It was patriotism that persuaded so many Frenchmen to serve in the military and for the rest of the population to accept the sacrifices necessary for the state to extract more of society's resources for war. Contradicting 'the usual view' that Napoleon commanded regular armies rather than armies of draftees because patriotism, promotion, pay increases and bonuses all motivated the conscripted and volunteers in the mobilised the National Guard to remain in the ranks.[35] French client regimes in Italy provided a large population from which to draw soldiers.

> "Between 1797 and 1814 the army recruited 164,000 conscripts and more than 44,000 volunteers from the Italian republics and the Kingdom of Italy. To these numbers, 50,000 troops from Naples and 164,000 from the departments of annexed to the French Empire (including 95,000 Piedmontese, 10,00 Tuscan and 23,000 Ligurians) should be added"[36].

Austrian Polish prisoners of war and later French occupied Poland provided many recruits for Napoleon.[37]

Austria filled the ranks through both recruitment and conscription. 'Conscription was imposed in the hereditary lands (Austria), Bohemia and, reluctantly, Galicia, but not in Hungary, Tyrol and northern Italy'[38]. Austria also created a *Landwehr* or 'home guard' from its German-speaking lands, but it was never fully exploited.[39] Austria also recruited *grenzers* or border troops in its South Slav possessions. Although Prussia would eventually nationalise its army by recruiting citizens rather than foreigners, it did not adopt conscription in any form until 1813,[40] and as a consequence, it struggled more than the three other continental great power rivals to deploy sufficient numbers. Unlike the armies of Austria and Prussia, the Russian Army was wholly conscripted from serfs belonging to the state or landlords. Service was for 25 years, which discouraged even the most patriotic of free Russians from enlisting. 'From 1812 to 1814, roughly one million men were drafted, more than two-thirds of them into the regular army'[41]. If the soldiers of France and its client states were motivated by republican patriotism, the soldiers of its enemies might have been motivated by nationalism that grew from resentment against the French.[42]

As a maritime power, England did not need to adopt conscription, though it nonetheless made us of conscripts during the Peninsular War. The Duke of Wellington used

**28** Andress, D. (2005). *The Terror: The Merciless War for Freedom in Revolutionary France*. Farrar, Strauss and Giroux, New York, p. 159.
**29** Andress, pp. 194-195.
**30** Nester, W. (2023). *The Coalitions against Napoleon: How British Money, Manufacturing and Military Power Forged the Alliances that Achieved Victory*. Frontline Books, Yorkshire, UK, p. 68.
**31** Mearsheimer, p. 282.
**32** Piketty, T. (2020). *Capital and Ideology*. Arthur Goldhammer, trans., Harvard University Press, Cambridge, pp. 471-472.
**33** Mearsheimer, p. 282.
**34** Gates, p. 35.
**35** Connelly, O. (2006). *The Wars of the French Revolution and Napoleon, 1792-1815*. Routledge, London, p. 117; Rothenberg, G. E. (1980). *The Art of War in the Age of Napoleon*. Indiana University Press, Bloomington, IN, p. 134.
**36** Isabella, p. 72.
**37** Esdaile. (2007), pp. 60-61, 136, 282.
**38** Boerke, A. M. (2009). Conscription in the Hapsburg empire in 1815. In: Stoker, D., Schneid, F. C., & Blanton, H. D. (eds), *Conscription in the Napoleonic Era: A Revolution in Military Affairs?* (Routledge, London, pp. 66-83), p. 76; Rothenberg, G. E. (1973). The Hapsburg Army in the Napoleonic Wars. *Military Affairs, 37*(1), p. 105, p. 1.
**39** Rothenberg. The Hapsburg Army in the Napoleonic Wars, p. 3.
**40** Walter, D. (2009). Meeting the French challenge: Conscription in Prussia, 1807-1815. In: Stoker, D., Schneid, F. C., & Blanton, H. D. (eds.), *Conscription in the Napoleonic Era: A Revolution in Military Affairs?* (Routledge, London, pp. 24-45), p. 30; Lefebvre, G. (1969). *Napoleon: From Tilsit to Waterloo, 1807-1815*. Columbia University Press, New York, pp. 264-265; Leggiere, M. V. (2002). *Napoleon and Berlin: The Franco-Prussian War in North Germany, 1813*. University of Oklahoma Press, Norman, OK, p. 57.
**41** Lieven, D. (2009). *Russia against Napoleon: The True Story of the Epic Campaigns of War and Peace*. Viking, New York, p. 117.
**42** Connelly. *The Wars of the French Revolution and Napoleon*, p. 219.

conscripted *ordenanza* or militia to defend Lisbon.[43] The French siege of the Portuguese capital was defeated by constructing the Lines of Torres Vedras – a chain of 59 redoubts and forts covering 22 miles of front using conscripts and then garrisoning those defences with conscripts.[44] The French abandoned the siege when they could no longer live off the surrounding countryside. Conscription was also crucial to the armies raised by Spain after 1812.[45]

From 1792, the conservative monarchies that opposed France waged war as members of international alliances, with the associated advantages and disadvantages. The burden of fielding large armies could be shared among the member states, but unity of command in multi-national armies was weaker. Napoleon is supposed to have said, 'If I must make war, I prefer it to be against a coalition'[46]. Decisions in the coalition armies fighting the French were often taken by consensus, which risked delay as commanders sought greater glory for themselves or to avoid casualties among their own troops.[47] The collective action problem of burden shifting was exacerbated by distrust between different national armies.[48] Soldiers serving in the armies of allied and client states might feel less patriotic inspiration than their counterparts serving in the armies of the great powers.

Many of the engagements of 1792–1815 involved multinational armies. Although demography together with republican ardour gave France an advantage over its great power rivals, the number of young Frenchmen who could be conscripted in any cohort was finite. Napoleon would be forced to recruit heavily among the occupied countries of the empire and to compel the participation of armies and recruits from allied counties in his campaigns. Under King Jérôme Bonaparte, for example, client state Westphalia produced disproportionately large numbers of conscripted and volunteer soldiers.[49]

> "Westphalians had a military tradition; her native leaders had deeply ingrained penchants for order and discipline, and they feared Napoleon. But within the army, Jérôme's policies and personal leadership ability counted heavily. The king took his soldiering seriously. He emphasised the German character of his army ... The army promoted patriotism and weakened provincial attitudes, softened class distinctions and encouraged religious tolerance. Hessians, Prussians, Hanoverians, Saxons and other Germans marched together in the same uniform. Officers came from all classes, though nobles were in the majority. Catholics, Calvinists, Lutherans and for the first time in any German army, Jews served together in the officer corps. The ranks were a similar amalgam. All this proved an advantage to the army"[50].

Occupying the Helvetic Republic in 1803, France imposed the Act of Mediation, under which 16,000 Swiss were recruited directly into the French Army. Those soldiers continued to bear arms in the French Army even after Switzerland declared neutrality following the 16–19 October 1813 Battle of Leipzig.[51]

Battalions of Germans, Italians and Poles featured not only in major battles but also in many lesser engagements. This provided the additional numbers needed but not always the quality of troops, 'who were a great disappointment in the front line'[52].

The republican and liberal reforms of the French Revolution were imposed outside France for the first time in the occupation of the Rhineland and then in every country in Europe subsequently invaded, 'by suppressing the local nobility, abolishing serfdom and putting new, elected governments in place by universal male suffrage'[53]. France also redrew national boundaries to create a new Europe comprising nation states. Napoleon's strategic 'intention was to reduce and isolate Austria, to enlarge Prussia, which he hoped to keep in the French camp, and to create a number of secondary states ...whose gratified rulers would be devoted allies'[54]. To that latter end, after occupying the Rhineland, France annexed numerous small German states to its client middle-sized German states: Baden, Bavaria, Württemberg and Hesse-Darmstadt, four countries which provided army units for Napoleon's campaigns or waged wars as allies against Napoleon's enemies.[55] Baden grew to seven times its original territory and

**43** Malkasian, p. 16.

**44** Muir, R. (2015). *Wellington: The Path to Victory, 1769-1814*. Yale University Press, New Haven, CT, pp. 368-369.

**45** Esdaile, C. J. (2009). Conscription in Spain in the Napoleonic Era. In: Stoker, D., Schneid, F. C., & Blanton, H. D. (eds.), *Conscription in the Napoleonic Era: A Revolution in Military Affairs?* (Routledge, London, pp. 102-121), pp. 102-103.

**46** Holsti, O. R., Hopmann, P. T., & Sullivan, J. D. (1973). *Unity and Disintegration in International Alliances: Comparative Studies*. John Wiley & Sons, New York, p. 22.

**47** Lieven, pp. 368-369.

**48** Berkovich, I. (2017). *Motivation in War: The Experience of Common Soldiers in Old-Regime Europe*. Cambridge University Press, Cambridge, pp. 192-193.

**49** Connelly, O. (1965). *Napoleon's Satellite Kingdoms*. The Free Press, New York, pp. 194-196.

**50** Connelly, *Napoleon's Satellite Kingdoms*, pp. 196-197.

**51** Riley, J. P. (2000). *Napoleon and the World War of 1813: Lessons in Coalition Warfighting*. Routledge, New York, p. 19.

**52** Lefebvre, p. 59.

**53** Ozment, S. (2004). *A Mighty Fortress: A New History of the German People*. Perennial, New York, p. 157.

**54** Zamoyski, A. (2007). *Rites of Peace: The Fall of Napoleon and the Congress of Vienna*. Harper Perennial, New York, p. 21.

**55** Ozment, p. 158.

Württemberg four times its original territory.[56] In 1806, the Holy Roman Empire was dissolved and the Confederation of the Rhine created from the surviving Rhenish states.[57] Napoleon would also create the Grand Duchy of Warsaw and the kingdoms of Italy and Naples. 'The restoration of a powerful Polish state was crucial if French hegemony in Europe was to survive. A restored Poland would be a far more reliable ally of France than the Hapsburg, Romanov or Hohenzollern monarchies could ever be'[58]. Poles would serve in Napoleon's campaigns across the continent and also in Saint-Domingue/Haiti.[59]

The French Senate proclaimed Napoleon 'Emperor of the French' on 18 March 1804 and he was crowned Emperor on 2 December 1805. Arguably that marked the end of the wars of the French Revolution and the beginning of the Napoleonic Wars. From 1805 to 1812, Napoleon's apparent grand strategy was to impose hegemony over the continent.[60] His geopolitical project was to replace the continent's five great powers with France as regional superpower power. Although the four great power rivals could be defeated *ad seriatum*, they could and ultimately did defeat France in coalition. Two wars of attrition – Iberia and Russia – doomed Napoleon's geopolitical project. Following a grand strategy devised by the Duke of Wellington, Britain, with its Hanoverian King's German Legion, Portugal and Spain fought the French and their Italian allies to a stalemate in the Peninsular War.[61] Although Napoleon deployed an additional 140,000 French and Italian troops to Spain in 1809, dynastic ambitions and a new marriage meant that he thereafter relied on his generals rather than assume command in that theatre.[62]

Napoleon's 1812 invasion of Russia was Napoleon's costliest gamble. Carter Malkasian was described as the 'grandest example of attrition in history'[63]. Influenced by Wellington's success against the French in Iberia, Tsar Alexander decided to follow the advice of his General Barclay de Tolly to avoid decisive battle that would risk his army of 400,000 against the 600,000 of Napoleon's Grande Armée and instead adopt scorched earth tactics to starve and deny shelter to the invaders while attacking their supply lines and foraging with Cossack cavalry.[64] Much of the Russian male peasanty that was not already in the regular army was conscripted into militia to assist the partisan units – regular army light cavalry plus Cossacks – in deterring foraging. Desertions among troops in allied state units further reduced the numbers of the Grande Armée. 'The Würtemberg division, 16,000 strong, only had 1,456 men by September 4'[65]. By the time that Napoleon occupied Moscow, he had only 95,000 troops and the burning of the city denied them respite. When the Russians finally fought the French at Borodino in a major battle, Napoleon was victorious. However, neither that nor subsequent victories at Krasnoe and the Beresina crossing meant that Napoleon had won his war with Russia. Forced to withdraw to Central Europe, by 1813, a weakened France together with its German and Italian allies fought a coalition of Russia, Prussia, Austria and Sweden.

## 3 Literature review

The unmistakable tendency among students of military science is to examine only subsets of the engagements comprising wars: decisive or major battles. For example, Henry A. Lachouque's traditional account, *Napoleon's Battles: A History of His Campaigns*, ignores lesser engagements to focus on the battles that can be given a sweeping interpretation.[66] The following passage gives the flavour of the approach. 'Marengo had given him Italy, the "foundation" of his Empire; Austerlitz had marked the end of the Holy Roman Empire; Friedland, with the Russians pushed out of Europe, would make it possible to complete the Napoleonic Empire'[67]. Although that focus makes for thrilling narratives, an immense amount of detail is sacrificed to reconstruct events in this manner.

Cathal J. Nolan's critique of the obsession of ambitious commanders with decisive battle as the objective in wars of manoeuvre argues that it reflects dismay at the butcher's bill in previous wars of attrition. Scholars can be

**56** Planert, U. (2006). From collaboration to resistance, politics, experience, and the memory of the revolutionary and Napoleonic Wars in Southern Germany. *Central European History, 39*(4), pp. 676-705, p. 677.

**57** Ozment, p. 159; Clark, p. 195; Esdaile. (2007), pp. 138-139.

**58** Lieven, p. 171.

**59** The 5200 strong Polish Legion was part of the army of 31,139 that Napoleon deployed in the 1802 reinvasion of Saint-Domingue/Haiti. See Marr, J. S., & Cathey, J. T. (2013). The 1802 saint domingue yellow fever epidemic and the Louisiana purchase. *Journal of Public Health Management Practice, 19*(1), pp. 77-82, p. 78.

**60** Mearsheimer, pp. 277-278; Opello, W. C. (2016). *War, Armed Force, and the People: State Formation and Transformation in Historical Perspective*. Rowman and Littlefield, London, p. 112.

**61** Lieven, p. 218.

**62** Lefebvre, p. 78.

**63** Malkasian, p. 17.

**64** Malkasian, pp. 17-19.

**65** Lefebvre, p. 314.

**66** Lachouque, H. A. (1967). Roy Monkcom, trans., *Napoleon's Battles: A History of His Campaigns*. E.P. Dutton, New York.

**67** Lachouque, p. 178.

forgiven for having the same responses to the seemingly unnecessary loss of life. Lanchester's square law has been the touchstone for scholars investigating attrition or the preponderance of force at the level of the battle, including D. Willard, Janice B. Fain, David L. Kirkpatrick and Felix Christoph Lotzin. Frederick William Lanchester proposed that the relative power of two armies in an engagement was proportional to their number of troops squared. Thus, in an engagement between two armies of comparably armed troops, one of which has twice the number of soldiers as the other, the larger army is not twice as powerful as the smaller army but instead four times as powerful. The open field battle of 1792–1815, perhaps without smoky confusion, is a nice approximation of the sort of engagement John W.R. Lepingwell describes for the Lanchester's square law.[68] 'Targets must be visible and targetable, and the consequences of fire must be determinable so that after a target is disabled, fire will be immediately shifted to a new target. If forces are line up along a wide front, concentration of fire is limited by the range of weapons, but the square law still holds in this case if the forces are deployed with uniform density along the sector of the front being modelled'[69].

Max Lenk et al.'s non-regression analysis of two data sets compiled from accounts found on Wikipedia, 102 French victories in major battles and 41 losses in major battles resulted in the conclusion that the armies of France tended to win against enemy armies with more soldiers.[70] Sean Clark's analysis of a data set of 618 major battles spanning all of recorded history found that 'troop preponderance' was decisive in a majority of these events only in the twentieth century, only one of the eight historical epochs examined.[71] The opposite was evident in the other seven epochs. D. Willard analysed the relationship between the numbers of soldiers and resulting casualties in 1,088 battles between 1618 and 1905, including 485 battles between 1792 and 1815.[72] His conclusion was that 'force ratio' did not explain the outcome of battles.[73] Fain's analysis of 60 engagements during the four major Italian campaigns of the Second World War also found that 'force ratios' were a poor predictor of success in battle.[74] Findings from analysis of a larger number of engagements presented here reach a somewhat different result from those of Clark, Willard and Fain.

David L. Kilpatrick's study focussed primarily on the American Civil War analysed only 28 open field battles.[75] He also surveyed comparable battles in the wars occurring before and after that struggle in small data sets, with the wars of the French Revolution and Napoleonic Wars presenting 23 engagements in three data sets of seven, eight and eight cases. Felix Christoph Lotzin analysed a data set of 158 major battles, drawn from the same chronological account compiled by Digby Smith used in the current study.[76] Lotzin's analysis was focussed on the value of Napoleon as a commander on the battlefield and found that he contributed to the success of French arms: 'His presence effectively doubled the French odds for every 17,000 French soldiers present'[77]. This conclusion is consistent with the empirical findings from analysis of a larger number of engagements presented here.

From an impressionistic analysis of casualties in a handful of engagements during the wars of French Revolution, Paddy Griffiths made several observations, one of which is relevant to this study: the French experienced larger relative casualties in battle than their enemies.[78] This conclusion is consistent with the empirical findings from analysis of a larger number of engagements presented here.

Much of the extant literature suffers from selection bias motivated by the conviction that what matters in war are large or decisive battles. The unfortunate results are findings based on the analysis of data sets comprising only large engagements. The problems with that approach are that the effect of the 'biggest battalions' on the outcome of engagements need not be limited to large or decisive battles and that medium and small engagements are part of the cumulative process in wars of attrition.

## 4 Data and methods

Just as in contemporary wars, comparisons of the numbers of casualties informed the understanding of victory

**68** Lepingwell, J. E. R. (1987). The laws of combat? Lanchester reexamined. *International Security, 12*(1), pp. 89-134, p. 93.

**69** Lepingwell, p. 93

**70** Lenk, M., Lenk, R., & Tofallis, C. (2014, October 14). Quantifying Victory: Napoleon's Armies' Victories and Losses. Available at http://dx.doi.org/10.2139/ssrn.2509740 [accessed 17 February, 2022].

**71** Clark, pp. 118-119.

**72** Willard, D. (1962). Lanchester as Force in History: An Analysis of Land Battles of the Years 1618-1905. Research Analysis Corporation, Bethesda, MD, pp. 9, 20-21.

**73** Willard, p. 28.

**74** Fain, J. B. (1977). The Lanchester equations and historical warfare: An analysis of Sixty World War II engagements. *History, Numbers, and War, 1*(1), 34-51, p. 36.

**75** Kirkpatrick, D. L. (2021). *How Important are Superior Numbers? A Reappraisal of Lanchester's Square Law*. Cambridge University Press, Cambridge.

**76** Lotzin, F. C. (2012). *The Emperor on the Battlefield: Napoleon's Worth as a Commander*. Anchor Academic, Hamburg, Germany.

**77** Lotzin, p. 62.

**78** Griffiths, p. 232.

and defeat by both decision-makers and their national publics in period between 1792 and 1815.[79] Victory was often assessed by comparing the numbers of people killed, wounded, deserted and captured and included numbers of captured cannon.[80] For example, in the Battle of Sediman on 7 October 1798, which decided the fate of Upper Egypt, the French Army experienced 144 dead and wounded soldiers along with 400 casualties among the Mamelukes, the elite cavalry recruited from the Balkans and Caucasus who ruled Egypt in the name of the Ottoman Sultan.[81] They French also captured two cannons from the Egyptians in a heroic bayonet charge.[82] Unfortunately, many of Digby Smith's accounts offer either incomplete or no information about the presence and losses of cannon.

The important numbers for the mass audiences of the period were the casualty counts. In describing the 2 December 1805 Battle of Austerlitz or Battle of the Three Emperors, Napoleon inflated the numbers of Russians dying by drowning in the frozen Satschen marshes, claiming that 20,000 were lost after he ordered his artillery to break up the ice, while minimising the number of French dead and wounded in the battle.[83] Russian losses were probably in the range of 2,000, most of them dying before they retreated into the mashes. Napoleon did the same after the 7–8 February 1807 Battle of Eylau: Although 12,000 French died or were wounded, 'in the 58th Bulletin of the Grande Armiée, the French losses were reduced to 1,900 killed and 5,700 wounded, while 7,000 Russians were reported dead…'[84]

The data for this study were collected from Digby Smith's 1998 *Greenhill Napoleonic Wars Data Book: Actions and Losses in Personnel, Colours, Standards and Artillery, 1792–1815*.[85] From this detailed chronological account, information was collected about victory or defeat and the total numbers of soldiers for the armies in engagements which took place on land. Smith was captive to his sources and therefore could describe many engagements not as total numbers of soldiers involved but only in numbers of units: battalions for infantry and squadrons for cavalry. The number of soldiers in a battalion of the period varied from 300 to more than 1,200, typically ranging from 500 to 700.[86] Comparing numbers is the heart of this research. To include engagements coded based upon numbers calculated from an average battalion size in the analysed data set would have introduced an unacceptable level of imprecision. Therefore, engagements in which either army was described in terms of units rather than numbers of soldiers were excluded as cases from the data set. That still left a large number of cases for analysis. Of the 1,159 engagements described in Smith's *Greenhill Napoleonic Wars Data Book*, data were collected for numbers of soldiers in contending armies in 945 engagements and for the number of soldiers and number of casualties in contending armies for 823 engagements. The larger of the data sets with 945 cases was used to assess the effects of six independent variables, most importantly the preponderance of numbers, on the outcome of engagements. The smaller data set with 823 cases was used to analyse the effects of seven independent variables on the relative casualties.

Rather than adopting logit regression, which treats dependent variables as dichotomous, as was Lotzin's methodological approach,[87] ordered logit regression was adopted here because the outcome of engagements can be coded as having three values. Smith's chronological record identifies the outcomes as victories, draws or defeats for France and/or its allies. Therefore, victory for France was coded as '2', a draw was coded as '1' and defeat was coded as '0'.

Ordinary least squares regression was adopted for the analysis of casualties because the dependent variable, casualty ratio, is a continuous variable. The casualty ratio was calculated for each engagement by subtracting the percentage of killed, wounded, captured or deserted soldiers in the armies of France and its allies by the percentage of all killed, wounded, captured or deserted soldiers in the armies of the enemies of France. Although the numbers of captured and deserted soldiers are not conventionally counted among casualties, they are nonetheless important as losses of troop strength in the process of attrition.

Based on the foregoing description of the historical context and the literature review, six independent variables were included in the model estimating engagement outcome. The single most important independent variable for the purpose of this research is the preponderance

**79** Hickman, J. (2009). What is a prisoner of war for? *Scientia Militaria: South African Journal of Military Studies, 36*(2), pp. 19-35.

**80** Strathern, P. (2009). *Napoleon in Egypt*. Bantam Books, New York, p. 281.

**81** Strathern, p. 281.

**82** Stathern, p. 282.

**83** Dwyer, P. (2013). *Citizen Emperor: Napoleon in Power*. Yale University Pres, New Haven, CT, pp. 205-206.

**84** Dwyer, pp. 241-242.

**85** Smith, D. (1998). *The Greenhill Napoleonic Wars Data Book: Actions, and Losses in Personnel, Colours, Standards, and Artillery, 1792-1815*. Greenhill Books, London.

**86** Muir, *Tactics and the Experience of Battle in the Age of Napoleon*, p. 68; Rothenberg, *The Art of War in the Age of Napoleon*, p. 138.

**87** Lotzin, p. 36.

ratio, calculated by dividing the total number of soldiers in the armies of France's enemies by the total number of soldiers in the armies of France and allies.

Four dichotomous independent variables were coded. The first dichotomous variable captures the nature of the political regime in France. Engagements fought during the French Revolution of 1792–1804 were coded as '0' and those fought during the Napoleonic Wars of 1805–1815 were coded as '1'. The second dichotomous variable reflects the effect of Napoleon on the battlefield as commander engagements in which he was not in command were coded as '0' and those in which he was in command were coded as '1'.

The next two dichotomous independent variables capture the effect of attrition in the locations where French armies experienced the defeats that ultimately doomed Napoleon's ambitions. For the third dichotomous variable, if the engagement took place in Spain or Portugal, it was coded as '1' and if elsewhere it was coded as '0'. For the fourth dichotomous variable, if the engagement took place in Russia, it was coded as '1' and if elsewhere it was coded as '0'.

The sixth independent variable is the total number of national armies in an engagement. This variable was coded by adding '1' to the minimum figure of '2' if at least one unit such as a battalion with a national identity distinct from the first two national armies took part in the engagement. Towards the end of the Napoleonic Wars, battles became very complex encounters between armies of France and its allies and the combined armies of its enemies.

**Tab. 1:** Summary data

| Characteristics | 945 Engagements | 823 Engagements |
|---|---|---|
| Battle Outcome | | |
| French victory | 442 | 399 |
| Draw | 34 | 26 |
| French defeat | 470 | 398 |
| Mean Preponderance Ratio | | |
| French victory | 4.209 | 4.400 |
| Draw | 0.007 | 1.494 |
| French defeat | 1.296 | 1.277 |
| Mean Casualty Ratio | | |
| French victory | – | −1.932 |
| Draw | – | 0.021 |
| French defeat | – | 0.235 |
| Number National Armies | | |
| Two | 635 | 552 |
| Three or more | 311 | 271 |

**Tab. 2:** Ordered logit coefficients, dependent variable: Engagement outcome

| Independent variables | Coefficient | Standard errors | Z score |
|---|---|---|---|
| Preponderance ratio | 0.2566* | 0.0415 | 6.17 |
| Napoleonic Wars 1805–1815 | −0.2840 | 0.1503 | −1.89 |
| Bonaparte Battlefield Command | 1.6079* | 0.3211 | 5.01 |
| Iberia | 0.4168* | 0.1894 | 2.20 |
| Russia | 0.0815 | 0.3160 | 0.26 |
| Number of national armies | −0.1004* | 0.0475 | −2.11 |
| Pseudo *R*-square | 0.0687 | | |
| *N* | 945 | | |

*Statistically significant at .05.

## 5 Findings

Summary data for the two data sets are displayed in Table 1. The first four rows describing battle outcomes for both data sets show roughly equal numbers of victories and defeats for the French and a smaller number of stalemated battles. Figures for mean preponderance ratios, the measure calculated for each engagement by dividing the total number of soldiers in the French armies by the total number of soldiers in opposing armies, for both data sets reported in the sixth row suggest that deploying more troops was indeed key to French victory. Marie de Rabutin-Chantal, marquise de Sévigné appears to have been correct. Moreover, as is shown in the eighth row, the French tended to deploy larger numbers than their enemies even in defeat.

Examination of the casualty ratio reported in the eleventh row shows that French victory was often expensive. Soldiers in the French Army were killed, wounded, captured or deserted at higher rates compared with those in enemy armies in victory than in engagements with other outcomes.

The ordered logit regression coefficients for preponderance ratio displayed in Table 2 reinforces the conclusion about the effect of numbers from the summary data in Table 1. Used as an indication of statistical significance, the Z score is defined as a measure of the multiples of standard deviation across a linear scale. Higher Z score values provide greater confidence that a statistical relationship exists. The Z score reported in the third row for preponderance ratio indicates that French and French-allied deployment of larger numbers of soldiers than the enemies of France is positively associated with victory statistically

**Tab. 3:** Regression coefficients, dependent variable: Casualty ratio

| Independent variables | Coefficient | Standard errors | *t*-stat |
|---|---|---|---|
| French victory, draw or loss | −0.3416 | 0.4559 | −0.75 |
| Napoleonic Wars 1805–1815 | −1.4569 | 0.9832 | −1.48 |
| Bonaparte Battlefield Command | 0.5015 | 1.7589 | 0.29 |
| Iberia | 0.9750 | 1.2449 | 0.78 |
| Russia | 0.7140 | 2.2787 | 0.031 |
| Preponderance ratio | −0.5051* | 0.02444 | −20.69 |
| Number of national armies | 0.1707 | 0.4754 | −0.36 |
| *R*-square | 0.3509 | | |
| *N* | 823 | | |

*Statistically significant at .05.

significant at the 0.05 level. The Z score reported in the fourth row indicating a positive association that is statistically significant at the 0.05 level between victory and Bonaparte as the battlefield commander offers evidence further supporting the Emperor's reputation as a military genius. Rather unexpectedly, the Z score reported in the fifth row indicates a positive association between victory and the location of the engagement in Portugal or Spain that is statistically significant at the 0.05 level. The Peninsular War undoubtedly drained the resources available to France; yet, the French were often victorious in individual engagements.

Finally, and unsurprisingly, the Z score reported in the eighth row indicates a negative association that is statistically significant at the 0.05 level between victory and the number of national armies in engagements. The Napoleonic project of continental hegemony appears to have been defeated, engagement by engagement, by the armies assembled by great powers coalitions. To measure the total amount of variation accounted for by a regression model, the dependent variable to be explained and the independent variable or variables, analysts use either the *R*-square or pseudo *R*-square method. *R*-squares are reported for results from ordinary least squares regression models, which are used when the dependent variable can be measured as a continuous variable, while pseudo *R*-squares are reported for results from logit regression models, where the dependent variable is measured dichotomously (two values) or at most three values. The pseudo *R*-square of 0.06 reported in Table 2 indicates that the model explains only approximately 6% of the variation in the dependent variable. Although that is disappointing, the Z-scores nonetheless reveal important structure in the data.

The ordinary least squares regression coefficients reported in Table 3 paint a picture of relative casualties consistent with the observation from the summary statistic reported in Table 1 that French victories were purchased at a high price. The counterpart to the Z scores indicating statistical significance reported in logit regressions findings are the t-stats in ordinary least squares regressions. The negative sign for the t-stat reported for preponderance ratio in the eighth row of Table 3 indicates an inverse or negative association between casualty ratio and preponderance ratio. Greater preponderance meant relatively higher casualties. The *R*-square of 0.35 for the model indicates that it explains 35% of the variation in the dependent variable.

# 6 Conclusion

The empirical analysis reported in this study made greater use of the potential of Digby Smith's chronological record that is a function of its conceptual liberation from an unfortunate, arguably myopic focus on decisive battles to examine the effect of the 'biggest battalions' on large and small engagements. The many 'non-decisive' medium and small engagements whose names fail to resonate in popular historical consciousness ultimately define the wars of attrition that often began as wars of manoeuvre. This study examines the effects of independent variables suggested by the historical context and literature review on two crucial dependent variables – outcome of the engagement and casualty ratio – using data sets that include many more of those engagements. Many factors may influence the outcome of a particular engagement. Yet, as the findings reported here demonstrate, the relative number of soldiers matters. Preponderance or greater numbers of soldiers was important in achieving victory at the engagement level, although it came at the price of relatively higher casualties at the engagement level. Revolutionary and Napoleonic France tended to win battle after battle because demography and ideology allowed it to pay each butcher's bill. Future research will hopefully map the cumulative effect of shifting relative capacity on the outcome of its multiple wars.

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