Using replication projects in teaching research methods

Lionel G. Standing, Manuel Grenier, Erica A. Lane, Meigan S. Roberts & Sarah J. Sykes

It is suggested that replication projects may be valuable in teaching research methods, and also address the current need in psychology for more independent verification of published studies. Their use in an undergraduate methods course is described, involving student teams who performed direct replications of four well-known experiments, yielding results which were subsequently published online. Illustrative data are given for the one successful replication and three failures obtained, and practical suggestions are given for incorporating replication projects into a methods course as an alternative to the usual term project. It is also noted that the published success rates of replication attempts appear to be higher for those studies that were performed as class projects.

Keywords: *Replication; teaching; research methods.*

THIS PAPER points to a pressing need in scientific psychology today for increased replication of earlier studies, and suggests a practical solution to this problem which also carries potential benefits for both students and teachers in research methods courses.

The replication crisis today

Rosenthal's (1979) seminal paper first pointed out the 'file drawer problem': journals print papers that are often based on Type 1 errors while the file drawers of researchers contain unpublished studies of the same topics showing null outcomes. Many commentators today believe that there is a 'crisis' within the discipline of psychology (Laws, 2013; Neuliep, 1990; Pashler & Wagenmakers, 2012; Ritchie, Wiseman & French, 2012; Yong, 2012). Very few reports of replication studies appear in psychology journals, despite a growing realisation that even major studies appearing in leading journals often fail to replicate successfully when this is attempted by independent investigators (Schmidt, 2009). The recent special issue of *Perspectives on Psychological Science* confirms the seriousness of this problem (Pashler & Harris, 2012), which also occurs in other scientific fields, for example, cancer research (Begley & Ellis, 2012).

Only 13 successful replications are reported among the 44 attempts that are posted currently on the PsychFileDrawer.org website, a success rate of 30 per cent overall; the targets are 30 prominent articles in human psychology. The most common area represented is priming, with 10 target studies and 18 replication attempts (sometimes more than one per target article) that yielded four successful replications and 14 failures, a success rate of only 22 per cent. It has also been noted that only about one per cent of psychology articles in psychology journals clearly involve replication attempts, and of these possibly 93 per cent succeed when published by the original authors, but only 69 per cent when published by new authors (Makel, Plucker & Hegarty, 2012). However, the pervasive file drawer problem means that the true situation is worse, since journals in most disciplines, including psychology, generally publish only positive results (Fanelli, 2011), resulting in the '…promulgation of numerous undead theories that are ideologically popular but have little basis in fact' (Ferguson & Heene, 2012, p.555).

Students in research methods courses are taught that replicability is a cardinal feature of the scientific method (e.g. McBurney &

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White, 2010, pp.208–210), but without demonstrable repeatability of findings the scientific enterprise is invalidated on logical grounds alone. It seems hypocritical to present this idea as a guarantee of methodological rigour when it is being violated in many cases today. Ioannidis (2012) argues that the estimate of 53 per cent for fallacies that are perpetuated in the literature which is proposed by Pashler and Harris (2012) may be too low, and that the true figure could reach 95 per cent in certain fields of psychology. At the least, numerical analyses suggest that a majority of published research findings are false (Ioannidis, 2005).

If a replication crisis exists, then constructive solutions are needed. The few replications that are published today lead to exchanges that are often protracted, inconclusive, or abrasive (e.g. Byrne et al., 1966; Chabris et al., 1999; Dijksterhuis, 2013; Doyen et al., 2012; Shanks et al., 2013; Wagenmakers et al., 2011).

Students as a strategic resource

Many suggestions have been advanced which ideally might overcome the replication problem (Asendorpf et al., 2013), for example, reward replication research as much as original work, require external replication of results before publication, or require studies to be registered in advance with a central registry. Brandt et al. (2014) have elaborated these ideas into a Replication Recipe with a checklist of 36 questions to guarantee a 'convincing' replication, but the likelihood of its general implementation appears minimal, due to reviewer bias against replications (Neuliep & Crandall, 1993), scarce journal space, the low prestige attached to replications, time constraints on researchers, and the restriction of funding to new work.

Some initiatives are evident here, since the online journal *BioMed Central Psychology* has pledged that it will 'put less emphasis on interest levels', and will publish repeat studies and negative results (Laws, 2013). Also the Association for Psychological Science has announced that its journal *Perspectives on Psychological Science* is now running a replication project with a standardised protocol (Gage, 2013; 'Registered replication reports', 2013), and PsychDisclosure.org has appeared as a public database for recently published articles, to provide additional methodological details (Lebel et al., 2013). Finally, occasional multi-experiment studies are published which exhaustively examine the replicability of a given effect (e.g. Shanks et al., 2013, present nine studies, with 475 participants, which all failed to replicate the intelligence priming effect).

However, approximately 123,000 new entries for peer-reviewed journal articles are added each year to PsycINFO, which already includes the abstracts of over 2,400,000 articles (only 32,000 of these, or 1.3 per cent, include the stem replicat* in the abstract). With so many unverified research findings, the most plausible way to reduce the problem may be to employ students as collaborators, as suggested by Grahe et al. (2012), and by Frank and Saxe (2012). As these authors argue, this would be good for the public scientific accountability of psychology, as well as for students and teachers. Students may represent an abundant and underutilised resource, assuming they may be relied upon to collect valid data, and in comparison with this possible problem, the likely payoffs appear considerable: enhanced scientific integrity of the field, a more manageable term project for the student, and easier classwork for a teacher to set up. Furthermore the new online posting forum PsychFileDrawer.org provides a simple, cost-efficient way to build up over time a public database of replication attempts and outcomes.

Typical problems with the traditional independent term project

Although a few individual student projects are published, on rare occasions becoming well-known (e.g. Pheterson, Kiesler & Goldberg, 1971; 'This week's citation classic',

1983), and an individual project might appear to be a desirable adjunct to standard lab exercises that are set up by the instructor, our experience over the years has been that most students find it very difficult within a single term or semester to meet the requirements for a meaningful independent project: an original hypothesis based on relevant literature, operationalisation of the key idea, preparation of materials, ethics approval, pilot testing and data collection, to be followed by data analysis and a written report.

For students who are fairly new to psychology, with other work to perform in the methods course, this is a major challenge, with time pressure often leading to experiments that have been described as '…silly, poorly designed, and unlikely to connect to current issues in psychological science' (Frank & Saxe, 2012, p.601). Proposed projects may show little theoretical understanding, knowledge of the literature, or scientific awareness. Too often the experimental hypothesis is unclear, or has been created by the teacher, with methodological flaws sometimes evident, and samples are usually so small that statistical power is low. By way of contrast, a two-term honours dissertation project involves a manageable schedule, generally leading to a much better study and possibly a joint publication with the supervisor.

For the above reasons, the senior author decided to offer students the option of performing a replication project in place of an independent term project. (All chose this more structured option.) Direct rather than conceptual replications were used, since the latter are logically subordinate to studies which first test for the existence of an effect before attempts are made to generalise it.

Implementing replication projects

This approach was developed in a three-credit advanced research methods class at a small university. This course is taken in the second year of a three-year psychology honours BA programme, and requires prior credit for a basic research methods course and two statistics courses, all taken in first year, with an average grade of at least 75 per cent. It is not likely that undergraduates without a prior background in methods or statistics would be suitable for this approach.

The instructor and class first chose four target articles from the current listing of papers given on PsychFileDrawer.org, with the results of at least one prior replication attempt posted, whether successful or not. (This is not essential, but provides a way to compare the class results not only with the target article but also with other replication attempts.)

To do this, the original papers listed in PsychFileDrawer.org were all scrutinised, and eliminated as possible targets if they involved practical difficulties re apparatus or materials, a very specialised or technical focus, lengthy or individualised testing requirements, or a complicated design. Instances were also noted of marginal statistical significance, low effect size, or large numbers of subjects (as we wished at least to match the *N* of each target study). When two experiments within a given study both appeared to be suitable, the one reporting the larger effect size was chosen so as to maximise statistical power. Each of the chosen papers included a multiple set of experiments, from which only one was selected for replication. The selection stage provides a useful opportunity to discuss with the class the issues of power, significance, and effect size by examining the original study and the number of subjects needed for the replication, facilitated by computational software (e.g. Allen & Hannent, 2013).

This process occupied about two weeks and led to the selection of the four papers posted in PsychFileDrawer.org which best met the above criteria. Three of these were priming studies (Dijksterhuis & van Knippenberg, 1998, Experiment 4; Vohs, Mead & Goode, 2006, Experiment 3; Williams & Bargh, 2008, Study 3). These studies reported that primes related to intelligence, money, or distance, respectively, raise cogni-

tive performance, reduce helpfulness, and cause lower caloric estimates for unhealthy foods. Despite recent controversy concerning the validity of some priming experiments (Bartlett, 2013), the selection of these three priming studies as targets was fortuitous and due solely to the above-mentioned criteria. The fourth study selected (Gailliot et al., 2007, Study 8) reported that ingesting a glucose drink enhances a subject's self-control when it has been threatened by thoughts of mortality.

Organising the teams

Although a replication may be performed by a pair of lab partners (Frank & Saxe, 2012), this would entail heavy time demands on the student, so we had the 24 members of the class sign up into four teams of six each, to spread the time load. This team size proved satisfactory, although the final choice is arbitrary.

One member of each team was designated as a co-ordinator, on the basis of a group vote, with responsibilities for preparing materials, consulting regularly with the instructor, organising team members to carry out the testing, and storing the data. Co-ordinators were required to test only a handful of subjects, for the experience, so as to equalise the total time load for them and their team members. There is no need to make all teams the same size, and if a given project requires many subjects to match the original sample size (or involves a lengthy testing procedure, or individual as opposed to group testing), the sizes of the teams may be adjusted so as to balance out the workload per student. Teams were encouraged to take personal responsibility for their projects.

Each student next wrote a graded proposal of about 10 pages in APA format, which they had already encountered in class, to ensure that they would be familiar with their target study. This proposal included a short literature review, details of the method and procedure gleaned from the target paper, and an outline template for the results section, as well as standard forms for informed consent and debriefing. The instructor handled the paperwork to obtain approval from the research ethics board for each project.

The instructor then met with each team, and discussed the details of their project to clarify details of its methods and procedure, for example, if the time allowed for a certain test was not specified in the report, a decision was made as to how to standardise it. Every attempt was made to follow the specifics of the target article closely, and in some cases details were obtained from the original authors by email. The numbers of subjects ultimately tested in the four studies were similar to those in the target papers, with respective values as follows (target article *N*s are given in parentheses): 48 (43), 58 (73), 40 (39), and 60 (59) participants.

Testing participants

The instructor met the co-ordinators individually to run through a trial testing session, taking the role of the subject. It is important first to create a standardised written protocol for all student testers to follow, once the details of materials and apparatus have been finalised. Each team thereafter largely ran their own project, performing their assigned testing in a departmental lab. When pilot testing and data collection had been completed, each co-ordinator collated their team's data sheets and prepared a composite SPSS data file in conjunction with the instructor, who cross-checked their statistical analysis. This data file was sent to the team members for use in writing up their reports, which were graded individually. Although participation in fact proved to be excellent, this was vouchsafed by explaining in the first class meeting that each person's contribution would be rated at the end by the other members of their team, using the Peer Evaluation Form of Herreid (2001). No objections were raised.

Results

With some monitoring by the instructor, the experiments all proceeded smoothly, with less stress evident over time pressures than is usual with term projects, and few logistic issues arising.

At the end of each project, each team member submitted a full report in APA format, which enlarged upon their proposal and included data, analysis, and conclusions. The report by each co-ordinator, suitably edited, also served as the preliminary basis for a composite final report, with their team members and the instructor listed as additional authors, which was posted on the public archive of replication attempts maintained at PsychFileDrawer.org (Grenier et al., 2012; Lane et al., 2012; Roberts et al., 2012; Sykes et al., 2012).

The four projects overall yielded one successful replication (of Gailliot et al., 2007), which showed almost the same effect size as the original study, and three failures (involving the three priming studies). Two of these three failures yielded non-significant differences in the opposite direction to the target article, and the composite effect size, averaged over the four experiments, was effectively zero. The data, given in Table 1, are quite typical for PsychFileDrawer.org, which lists six other failures to replicate these three priming studies, and no successes.

It may be noted that even though we were able to replicate Study 8 of the study by Gaillot et al., PsychFileDrawer.com lists an unsuccessful attempt at replicating Study 7 of that paper (Cesario & Corker, 2010), and the theory of glucose as an aid to self-control has elsewhere been challenged (Kurzban, 2011; Molden et al., 2012). Conversely, although we failed to replicate Vohs et al. (2006), other studies have found a link between money-priming and reduced helpfulness (e.g. Chatterjee, Rose & Sinha, 2013, Gasiorowska & Helka, 2012; Roberts & Roberts, 2012). A failure to replicate a given study does not prove that it was faulty.

Table 1: Comparison of target study and replication results.

Target study	Target study finding	Target study result		Replication result		Did the replication succeed?
		d	*p*	*d*	*p*	
1	Verbal priming raises intelligence	0.85	<.02	-0.29	.84	No
2	Glucose aids self-control processes	.65	.05	0.30	.03	Yes
3	Money priming reduces helpfulness	0.66	<.05	0.08	.42	No
4	Distance prime alters calorie estimates	0.90	.04	-0.023	.70	No
	Mean *d*=	0.69		0.017		

Note: *d*=effect size
Target study 1=Dijksterhuis & van Knippenberg (1998), Experiment 4.
Target study 2=Gailliot et al. (2007), Study 8.
Target study 3=Vohs, Mead & Goode (2006), Experiment 3.
Target study 4=Williams & Bargh (2008), Study 3.

Conclusions and discussion

We believe that the approach outlined here can bridge the gap between the classroom and the world of psychological research, yielding much-needed scientific information as well as meaningful project work that incorporates diverse active/reflective and abstract/concrete aspects of learning (Kolb, 1984). Students encountered replication as a requirement for scientific progress, examined issues of power and effect size, and engaged in some critical thinking. They also improved their report writing, computing, and statistical skills, and learned to work collaboratively. In comparison with previous years, it was easier to organise the class work, and students were less anxious over their projects, working in teams within a pre-established template. This team interaction may help with the problem of statistics-anxiety (Williams, 2010). They showed good motivation, contributing suggestions and raising points for clarification, and seemed pleased when they finally achieved an online publication.

A further benefit of this approach is that it involves many fewer different projects, using pre-established methodology, which may facilitate early approval from an ethics board, whereas with individual projects a month's delay can occur, seriously hampering the collection of data.

The ultimate benefit of replication studies hopefully may spread throughout the field of psychology as the reliability of major studies is clarified through further internet postings. This approach appears to produce a win-win-win situation. We encountered no real problems, and can recommend this idea for adoption by instructors who are teaching a methods or lab course with students who already know some basic statistics and methodology.

The responsibility for writing the proposal and the final report may be assigned to individuals, pairs of lab partners, or teams. The basic framework is flexible, and could be adapted so that, for example, some teams independently attempt to replicate the same target article, to explore a further dimension of replicability. Or different teams could attempt to repeat the various experiments comprising a given paper. Repeating a replication attempt in successive years would provide another index of reliability. In the case of a between-subjects design, extra groups can be added to create a replication-extension study where both an exact and a conceptual replication are attempted concurrently, to test the reliability of the original finding and explore moderator effects which might explain it (Bonett, 2012). This approach might be suitable for an honours dissertation (e.g. Carlin & Standing, 2013), or a graduate thesis. Some studies are beyond the capacities of undergraduate students, but may be suited to graduate students (Frank & Saxe, 2012).

It has been argued that failures to replicate occur because psychology students do not have the necessary methodological skills to perform valid studies (Dijksterhuis, 2013), and if there is any increased noise in a system due to inexperienced testers then this might seem more likely to produce a Type II than a Type I error. But the evidence to date suggests otherwise. Fourteen of the 44 studies listed by PsychFileDrawer.com (at 6 January 2014) are listed as having been performed as class projects. These class projects actually showed a *higher* probability of achieving replication (seven successes in 14 attempts), than the remaining studies (6 successes out of 30). This difference is reliable (Fisher's exact test, p=.049; Cramér's V, p=.042), a result which directly contradicts Dijksterhuis's hypothesis, perhaps because the file drawer effect operates more strongly when student investigators are involved.

We suggest that for simple studies, performed with faculty monitoring, a satisfactory level of reliability can probably be achieved. We note that the target papers for replication are themselves often based on data that were collected by students under supervision. Should this view seem too optimistic, then a control test would resolve the issue. If it is possible to identify some experi-

mental effect that unquestionably *does* exist, then we could determine how many out of 100 student experimenters succeed in reproducing it. A validity check of this type would complement the current approach and assess whether serious measurement error is introduced by the use of student investigators.

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The Authors

Lionel G. Standing
Manuel Grenier
Erica A. Lane
Meigan S. Roberts
Sarah J. Sykes
Department of Psychology,
Bishop's University.

Correspondence

Lionel G. Standing
Department of Psychology,
Bishop's University,
2600 College Street,
Sherbrooke QC,
Canada J1M 1Z7.
Email: lstandin@ubishops.ca

References

Allen, R. & Hannent, I. (2013). *A new computerised power calculator with graphical interface*. Available at: http://homepages.gold.ac.uk/ps-tec/powercalculator/

Asendorpf, J.B., Conner, M., De Fruyt, F., De Houwer, J., Denissen, J.J., Fiedler, K. & Wicherts, J.M. (2013). Recommendations for increasing replicability in psychology. *European Journal of Personality, 27*,108–119.

Bartlett, T. (2013). Power of suggestion. *Chronicle of Higher Education*. Available at: http://chronicle.com/article/Power-of-Suggestion/136907/

Begley, C.G. & Ellis, L.M. (2012). Drug development: Raise standards for pre-clinical cancer research. *Nature, 483*(7391), 531–533.

Bonett, D.G. (2012). Replication-extension studies. *Current Directions in Psychological Science, 21*, 409–412.

Brandt, M.J., IJzerman, H., Dijksterhuis, A., Farach, F.J., Geller, J., Giner-Sorolla, R. & van't Veer, A. (2014). The replication recipe: What makes for a convincing replication? *Journal of Experimental Social Psychology, 50*, 217–224.

Byrne, W.L., Samuel, D., Bennett, E.L., Rosenzweig, M.R, Wasserman, E., Wagner, A.R. & Carbon, P.L. (1966). Memory transfer. *Science, 153*, 658–659.

Carlin, S.P. & Standing, L.G. (2013). Is intelligence enhanced by letter priming? A failure to replicate the results of Ciani and Sheldon (2010). *Psychological Reports, 112*, 533–544.

Cesario, J. & Corker, K. (2010). *Glucose drinks and self-control (Stroop)*. Available at: http://www. psychfiledrawer.org/replication.php?attempt=MTIw

Chabris, C.F., Steele, K.M., Bella, S.D., Peretz, I., Dunlop, T., Dawe, L.A. & Rauscher, F.H. (1999, 26 August). Prelude or requiem for the 'Mozart effect'? *Science, 400*(6747), 826–827.

Chatterjee, P., Rose, R.L. & Sinha, J. (2013). Why money meanings matter in decisions to donate time and money. *Marketing Letters, 24*, 109–118.

Dijksterhuis, A. (2013, 25 April). Replication crisis or crisis in replication? A reinterpretation of Shanks et al. *PLoS ONE Reader comments*. Available at: http://www.plosone.org/annotation/listThread.action?root=64751

Dijksterhuis, A. & van Knippenberg, A. (1998). The relation between perception and behavior, or how to win a game of Trivial Pursuit. *Journal of Personality and Social Psychology, 74*, 865–877.

Doyen, S., Klein, O., Pichon, C.-L. & Cleeremans, A. (2012). Behavioral priming: It's all in the mind, but whose mind? *PLoS ONE, 7*(1), e29081.

Fanelli, D. (2011). Negative results are disappearing from most disciplines and countries. *Scientometrics, 90*, 891.

Ferguson, C.J. & Heene, M. (2012). A vast graveyard of undead theories: Publication bias and psychological science's aversion to the null. *Perspectives on Psychological Science, 7*, 555–561.

Frank, M.C. & Saxe, R. (2012). Teaching replication. *Perspectives on Psychological Science, 7*, 600–604.

Gage, S. (2013, May 15). Psychology uses 'registered replication reports' to improve reliability. *Guardian Blog*. Available at: http://www.guardian.co.uk/science/sifting-the-evidence/2013/may/15/psychology-registered-replication-reports-reliability

Gailliot, M.T., Baumeister, R.F., DeWall, C.N., Maner, J.K., Plant, E.A., Tice, D.M., Brewer, L.E. & Schmeichel, B.J. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology, 92*, 325–336.

Gasiorowska, A. & Helka, A.M. (2012). Psychological consequences of money and money attitudes in dictator game. *Polish Psychological Bulletin, 43*, 20–26.

Grahe, J.E., Reifman, A., Hermann, A.D., Walker, M., Oleson, K.C., Nario-Redmond, M. & Wiebe, R.P. (2012). Harnessing the undiscovered resource of student research projects. *Perspectives on Psychological Science, 7*, 605–607.

Grenier, M., Bertrand, T., Dupuis Laflamme, P., Pepin, E., Webster, L.E., Wheeler, L.E. & Standing, L.G. (2012). *A replication of Vohs, Mead and Goode* (2006). Available at: http://www.PsychFileDrawer.org/chart.php?target_article=32

Herreid, C.F. (2001). When justice peeks: Evaluating students in case study teaching. *Journal of College Science Teaching, 30*, 430–433.

Ioannidis, J.P. (2005). Why most published research findings are false. *PLoS Med, 2*(8): e124.

Ioannidis, J.P. (2012). Why science is not necessarily self-correcting. *Perspectives on Psychological Science, 7*, 645–654.

Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Kurzban, R. (2011). Glucose is not willpower fuel. *Psychology Today*. Available at: http://www.psychologytoday.com/blog/mind-design/201108/glucose-is-not-willpower-fuel

Lane, E.A., Beadman, K.S., Bélisle, A.M., Campbell, R.M., Cournoyer Lemaire, E., Stewart, D. & Standing, L.G. (2012). *Mortality salience improves rather than impairs self-control: A replication of Gailliot, Baumeister et al.* (2007). Available at: http://www.PsychFileDrawer.org/chart.php?target_ article=29

Laws, K. (2013, 27 February). It's time for psychologists to put their house in order. *Guardian Science blog*. Available at: http://www.guardian.co.uk/science/blog/2013/feb/27/ psychologists-bmc-psychology

Lebel, E.P., Borsboom, D., Giner-Sorolla, R., Hasselman, F., Peters, K.R., Ratliff, K.A. & Smith, C.T. (2013). Grassroots support for reforming reporting standards in psychology. *Perspectives on Psychological Science, 8*, 424–432.

Makel, M.C., Plucker, J.A. & Hegarty, B. (2012). Replications in psychology research: How often do they really occur? *Perspectives on Psychological Science, 7*, 537–542.

McBurney, D. & White, T. (2010). *Research methods* (8th ed.). Belmont, CA: Wadsworth.

Molden, D.C., Hui, C.M., Scholer, A.A., Meier, B.P., Noreen, E.E., D'Agostino, P.R. & Martin, V. (2012). Motivational versus metabolic effects of carbohydrates on self-control. *Psychological Science, 23*, 1137–1144.

Neuliep, J.W. (Ed.). (1990). *Handbook of replication research in the behavioral and social sciences*. Corte Madera, CA: Select Press.

Neuliep, J.W. & Crandall, R. (1993). Reviewer bias against replication research. *Journal of Social Behavior & Personality, 8*, 1–8.

Pashler, H. & Harris, C.R. (2012). Is the replicability crisis overblown? Three arguments examined. *Perspectives on Psychological Science, 7*, 531–536.

Pashler, H. & Wagenmakers, E. (2012). Editors' introduction to the Special Section on replicability in psychological science: A crisis of confidence? *Perspectives on Psychological Science, 7*, 528–530.

Pheterson, G.I., Kiesler, S.B. & Goldberg, P.A. (1971). Evaluation of the performance of women as a function of their sex, achievement, and personal history. *Journal of Personality and Social Psychology, 19*, 114–118.

Registered Replication Reports (2013). *Association for Psychological Science*. Available at: http://www.psychologicalscience.org/index.php/replication

Ritchie, S.J., Wiseman, R. & French, C.C. (2012). Replication, replication, replication. *The Psychologist, 25*, 346–357.

Roberts, J.A. & Roberts, C.R. (2012). Money matters: Does the symbolic presence of money affect charitable giving and attitudes among adolescents? *Young Consumers, 13*, 329–336.

Roberts, M.S., Crooks, W., Kolody, T.J., Pavlovic, T., Rombola, K.J. & Standing, L.G. (2012). *No effect on intelligence from priming: A replication of Dijksterhuis and van Knippenberg* (1998). Available at: http://www.PsychFileDrawer.org/chart.php?target_article=33

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin, 86*, 638–641.

Schmidt, S. (2009). Shall we really do it again? The powerful concept of replication is neglected in the social sciences. *Review of General Psychology, 13*, 90–100.

Shanks, D.R., Newell, B.R., Lee, E.H., Balakrishnan, D., Ekelund, L., Cenac, Z., Kavvadia, F. & Moore, C. (2012). Priming intelligent behavior: An elusive phenomenon. *PLoS ONE, 8*(4): e56515.

Sykes, S.J., Carr Kinnear, C.D., Carrière, J.S., Chatelain, M.C., Chieco, A., Santini, S.E. & Standing, L.G. (2012). *A replication of Williams and Bargh* (2008). Available at: http://www.psychfiledrawer.org/chart.php?target_article=2

This Week's Citation Classic (1983, 17 October). *ISI Current Contents, 42*, 20.

Vohs, K.D., Mead, N.L. & Goode, M.R. (2006). The psychological consequences of money. *Science, 314*(5802), 1154–1156.

Wagenmakers, E.J., Wetzels, R., Borsboom, D. & van der Maas, H.L. (2011). Why psychologists must change the way they analyse their data: The case of psi: Comment on Bem (2011). *Journal of Personality and Social Psychology, 100*, 426–432.

Williams, A.S. (2010). Statistics anxiety and instructor immediacy. *Journal of Statistics Education, 18*. Available at: http://www.amstat.org/publications/jse/v18n2/williams.pdf.

Williams, L.E. & Bargh, J.A. (2008). Keeping one's distance: The influence of spatial distance cues on affect and evaluation. *Psychological Science, 19*, 302–308.

Yong, E. (2012, 17 May). Replication studies: Bad copy. *Nature, 485*(7398), 279–410.