ORIGINAL ARTICLE

# Timeouts and psychological momentum in volleyball

**Ho Phi Huynh** . *School of Medicine and Psychology. Australian National University. Acton, Australia.*
**Joel Goh.** *School of Medicine and Psychology. Australian National University. Acton, Australia.*
**William Condon.** *Athletics. Lindenwood University. St. Louis, Missouri, United States of America.*
**Kristin Layous.** *Department of Psychology. California State University, East Bay. Hayward, California, United States of America.*

## ABSTRACT

Coaching strategies reflect the belief that volleyball is a momentum-driven sport. This study investigated whether timeouts are associated with success for the subsequent play (i.e., a "*sideout*") using archival data from Women's Division I Volleyball in the United States. Sideout rates following 2529 timeouts from 234 matches were compared to the sideout rates of typical play from 3867 plays taken from 25 randomly selected matches. Results showed that the sideout rate for points following a timeout was similar to the sideout rate of typical play, suggesting that timeouts could be employed to reset performance. Additionally, the sideout rate was higher after timeouts when they were taken early in a scoring run as opposed to later in a run, and when the score difference is within 3 points, indicating that timeouts could thwart the buildup of momentum. These results have implications for the understanding of psychological momentum and coaching.
**Keywords**: Psychological momentum, Volleyball, Timeout, Coaching, Sports psychology.

**Cite this article as:**
Huynh, H. P., Goh, J., Condon, W., & Layous, K. (2025). Timeouts and psychological momentum in volleyball. *Journal of Human Sport and Exercise, 20*(3), 1068-1075. https://doi.org/10.55860/0tnkh516

**Corresponding author.** *School of Medicine and Psychology. Australian National University. Acton, ACT, 2601 Australia.*
E-mail: ho.huynh@anu.edu.au
Submitted for publication March 07, 2025.
Accepted for publication April 13, 2025.
Published May 29, 2025.
Journal of Human Sport and Exercise. ISSN 1988-5202.

**doi:** https://doi.org/10.55860/0tnkh516

## INTRODUCTION

Volleyball is a rapidly growing sport, with more than 800 million participants worldwide (Peter, 2024). It surpassed basketball as the most popular sport for high school girls in the United States in 2015; 96 percent of all National Collegiate Athletic Association (NCAA) schools and over 1,800 colleges and universities sponsor a women's volleyball team (NCSA, n.d.). As the sport gains broader attention, the common coaching practice of using timeouts to interrupt psychological momentum needs to be empirically examined. Although timeouts are available to both teams in volleyball, they are taken almost exclusively by the offensive team when they fail to execute a "*sideout*" play to earn a point (i.e., when they are on the losing side of the momentum shift). This study critically evaluated this strategy and examined the broader implications for the understanding of psychological momentum, particularly coaching strategies as interventions to interrupt psychological momentum.

### *Psychological Momentum (PM)*

Although different conceptions of Psychological Momentum (PM) exists, we follow the Iso-Ahola and Dotson's (2014) view that it is a perceptual phenomenon during which an individual performer or team has some initial success and builds a sense that they will continue to do well. The positive PM of one side is also felt by their opponent, whose initial lack of success both fuels their opponent's positive PM and their own downward spiral (negative PM). More specifically, PM represents a display of sequential dependence, whereby initial success leads to subsequent success (positive PM), and initial failure leads to subsequent failure (negative PM). PM has different qualities, such as frequency (how often PM occurs; a team may gain PM at various times throughout a match), intensity (how strong is the PM; a team may win a point after a long and hard fought rally), and duration (how long PM lasts; a team may ride a wave of momentum for many consecutive points during a game).

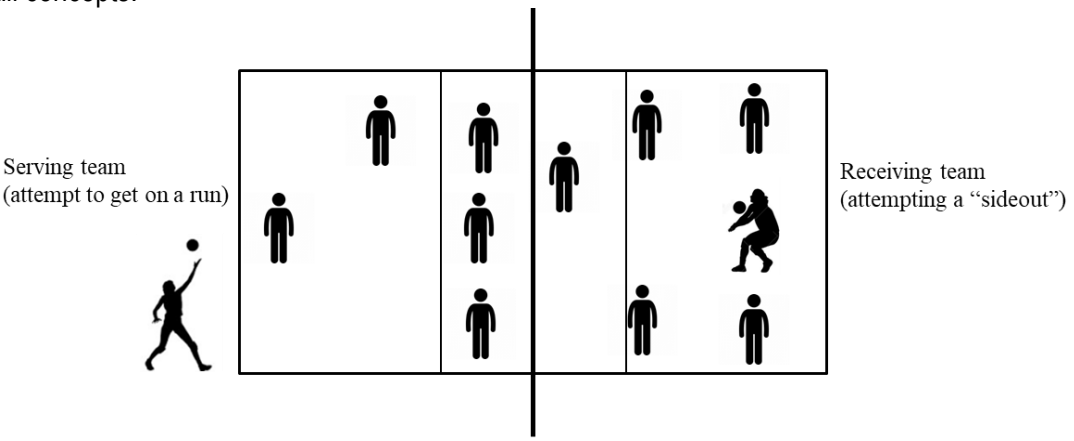
Participants (players and coaches) go to great lengths to achieve positive PM and interrupt negative PM. For example, football coaches take timeouts before kickers attempt game ending field goals (Goldschmied et al., 2010; Hsu et al., 2019), basketball coaches take timeouts to ice free throw shooters or when being outscored by opponents (Mace et al., 1992; Goldschmied et al., 2023; Roane et al., 2004), and coaches would urge teammates to give more opportunities to a player with the "*hot hand*" (e.g., Bar-Eli et al., 2006; Gilovich et al., 1985; Raab et al., 2012; Yaari & Eisenmann, 2011).

Patterns of timeout-taking behaviour exhibited by coaches suggest that coaches believe that PM exists and could be interrupted by using timeouts. If initial success leads to subsequent success, then coaches' use of timeouts can represent an attempt to thwart the opponent's positive PM and end one's own negative PM (Hartigh & Gernigon, 2018). In volleyball, the effectiveness of this strategy can be measured by whether the team taking a timeout wins the point following the timeout. If one wins the point following the timeout, then one has made a successful (albeit perhaps temporary) attempt at interrupting the ongoing PM.

### *Psychological momentum in volleyball*

In volleyball, the serving team plays defence first while the team receiving the serve plays offense first (i.e., they have the first opportunity to execute an offensive play). A *sideout* is achieved when the team receiving the serve wins the point. (We note that we are using the term *sideout* to refer to this specific point, and not the outdated scoring system that was employed until to the late 1990s when it was replaced by the current rally scoring system). Only the serving team can win consecutive points by preventing the receiving team from completing a sideout. Therefore, only the serving team can gain positive PM, while the receiving team is left attempting to interrupt that momentum and preventing negative PM by avoiding losing several points

in a row. Although available to both teams, timeouts are taken almost exclusively (99.72% of the time in our dataset) by the team attempting to execute a sideout. This strategy can be interpreted as the use of timeouts to interrupt the opponent's positive PM and one's own negative PM. See Figure 1 for a summary of basic volleyball concepts.




*Note. The serving team can create positive PM by winning consecutive points (i.e., "getting on a run"). Scoring runs only occur for the serving team. The receiving team uses timeouts as a strategy to achieve a sideout. If the receiving team successfully completes a sideout, then it becomes the serving team.*

Figure 1. Volleyball basics.

Taking the position that timeouts could be effective at interrupting PM, we made the following predictions. *Hypothesis 1*: The sideout rate following a timeout would be higher than the sideout rate of typical play (when there is no timeout), which reflects Iso-Ahola and Dotson's [2014] conception of PM as a perceptual phenomenon. *Hypothesis 2*: The sideout rate for timeouts taken before a team establishes momentum should be higher than the sideout rate of timeouts taken after a team establishes momentum. That is, the sideout rate for timeouts taken before a team gets on a scoring run (scores three or less consecutive points) should be higher compared to the sideout rate when a team establishes a run (scores four or more consecutive points). *Hypothesis 3:* The sideout rate for timeouts taken while the outcome of the game is still within reach for both teams (score difference of three points or fewer) should be higher compared to the sideout rate for timeouts when the outcome of the game is more out of reach (score difference of 4 points or more). Hypotheses 2 and 3 specifically addresses the duration aspect of PM in the Iso-Ahola and Dotson model of PM. We examined these hypotheses using NCAA Division 1 archival data.

## METHOD

We examined archived play-by-play for all matches played during a full season in the Big10 Conference in 2013 (available on stats.ncaa.org). We selected the Big10 Conference because it is considered the most competitive conference for Women's Division I Volleyball. In particular, the national championship match for this season featured two teams from the Big10 Conference (Penn State and Wisconsin). The archived play-by-play records document the name of serving team, the score at the start of the point, and the outcome of the point. The play-by-play records also note if a timeout was taken before the point, and if there was a timeout, which team requested the timeout. These records were manually extracted and coded into an Excel file by a research assistant under the supervision of the first author, who conducted checks to ensure accuracy of the data extraction. We coded 234 matches, where 2529 timeouts occurred. In the final analysis, we excluded seven timeouts because they were taken by the serving team (not by the team attempting the sideout). These seven timeouts represented 0.28 percent of all timeouts taken. Thus, the final total sample

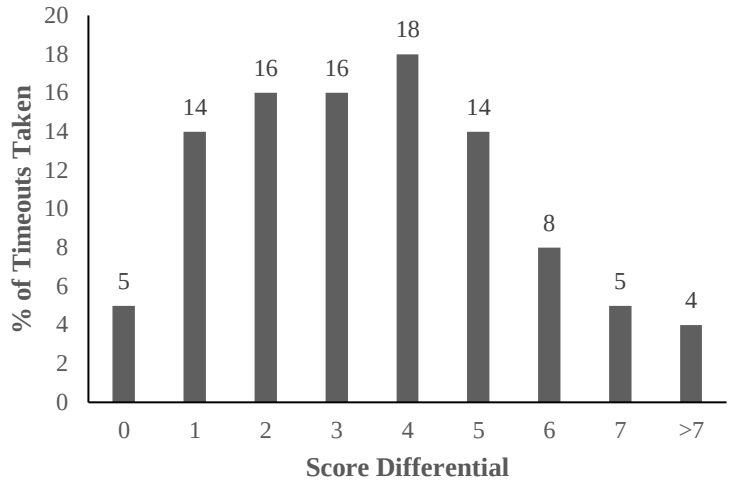
 

included 2522 timeouts. In addition to coding plays that involved timeouts, we also coded plays that did not involve timeouts ("*typical play*") to serve as the comparison group. We randomly selected 25 matches in the same conference and year and coded outcomes of 3867 typical plays to serve as the comparison group for timeouts.

## RESULTS

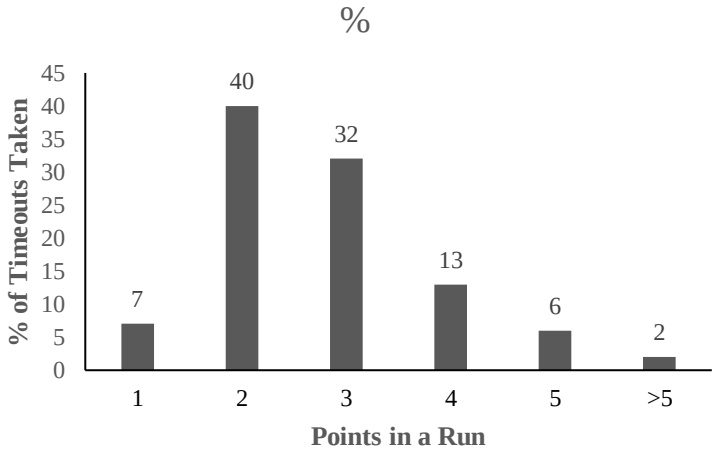
### *General timeout patterns*

Coaches used timeouts when the score differential is low (51% of timeouts taken when the score differential is three points or fewer; 78% of timeouts taken when score differential is 5 or fewer). In addition, coaches tend to use timeouts early in scoring runs (79% of timeouts taken when the run is between 1 and 3 points; 92% of timeouts taken when the run is between 1 and 4 points). See Figures 2 and 3 for details.




*Note. The majority of timeouts are taken when the score difference is between 1 and 5 points.*

Figure 2. Percent of timeouts taken by score differential.




*Note. The majority of timeouts are taken when the serving team scores two or three points in a row.*

Figure 3. Percent of timeouts taken by points in a run.

### *Effectiveness of timeouts*

We employed chi-square goodness of fit tests to assess potential differences between the sideout rate after timeouts compared to typical play, because this test allowed us to compare observed frequencies with expected frequencies. We also report Cohen's ω, which follow the conventional threshold of .10 for small, .30 for medium, and .50 for large effect sizes (Cohen, 2016). The team receiving the serve won the point (i.e., completed a successful side out) 58.08% of the time in the course of typical play when there was no timeout ($N$ = 3867). In other words, the sideout rate of typical play was 58.08%. Surprisingly, the sideout rate for points following a timeout was 58.6%, which is not different from the sideout rate of typical play, $\chi^2$ (1, $N$ = 2522) = 0.33, $p$ =.56, ω = .001. However, timeouts are effective when they are taken when the score difference is within 3 points (sideout rate = 59.9%) compared to when the difference is beyond 3 points (sideout rate 54.1%), $\chi^2$ (1, $N$ = 1986) = 26.62, $p$ <.001, ω = .60. Furthermore, timeouts also tend to be more effective when taken early in a run (between 1-3 points; 61.0%) as opposed to later in a run (>3 points; 56.3%), $\chi^2$ (1, $N$ = 861) = 11.35, $p$ <.001, ω = .39. See Table 1 for a comparison of effectiveness of timeouts across various scenarios.

Table 1. Comparisons of sideout rates.

| | n | Sideout % | $\chi^2$ | *p* | ω |
|---|---|---|---|---|---|
| **Typical Play (Expected Rate)** | 3867 | 58.08 | | | |
| **Various situations compared to typical play** | | | | | |
| After timeout | 2522 | 58.64 | 0.33 | .56 | .01 |
| Score difference 0-3 | 1252 | 61* | 4.45 | .035 | .13 |
| Score difference >3 | 1270 | 56.3 | 1.65 | .20 | .05 |
| Run of 1-3 | 1986 | 59.9 | 2.61 | .11 | .06 |
| Run of >3 | 536 | 54.1 | 3.48 | .06 | .15 |
| **Various situations compared to each other** | | | | | |
| Run of 1-3 vs. Run above 3 | 1986 | 59.9 vs. 54.1** | 26.62 | <.0001 | .60 |
| Score difference 0-3 vs. above 3 | 861 | 61.0 vs. 56.3** | 11.35 | .001 | .39 |

*Note. Timeouts are effective when they are taken when the score difference is within 3 points. Timeouts also tend to be more effective when taken early in a run as opposed to later in a run. However, there is no general effect of taking timeouts when comparing all points played after a timeout and points during typical play.*

## DISCUSSION

The data showed that the rate of successful sideouts following a timeout is no different than the sideout rate of typical play, indicating no support for Hypothesis 1. However, the interpretation of this fact may benefit from some nuance. From one perspective, one can claim that timeouts are not effective because they do not increase the rate of sideout above the rate of sideout for typical play. On the other hand, the use of timeouts brings the sideout rate back to be equivalent to the rate of typical play, which can be interpreted in favour of timeout's effectiveness. Additionally, it seems that timeouts help the receiving team maintain their advantage as the receiving team. This pattern could be interpreted as a change in momentum considering that teams that take the timeout are typically at a disadvantaged position from the perspective of psychological momentum (i.e., 99.72% of the time, timeouts are taken by the team that needs to execute a sideout play). Therefore, it could be considered a success if teams are able to return to their normal level of functioning. That is, timeouts could be perceived as effective for stabilizing and resetting team performance.

The evidence for the effectiveness of timeouts to curb psychological momentum is much stronger in situations relating to scoring runs and scoring differentials. We found that a timeout taken prior to the opponent scoring

3 or fewer points in a row is more effective than a timeout taken after the opponent scores 4 or more points in a row, supporting Hypothesis 2. The same is true for when timeouts are taken when the score difference is less than or equal to 3 points compared to more than 3 points, supporting Hypothesis 3. Reflecting these trends, it appears that coaches understand the importance of these critical junctures. For example, 79% of timeouts were taken by coaches after the other team has scored 3 or fewer points in a row. However, only 51% of timeouts were taken when the score differential was 3 or fewer points. Our data suggests that it might be prudent for coaches to use their timeouts not only to deter scoring runs, but to also when the scores are well within reach in order to maximize timeout's effectiveness. This suggestion is also supported by previous works that show that athletes tend to exert more effort at the start of PM and decrease effort as PM continues (Briki et al., 2013).

The results about the specific scenarios in which timeouts are most effective also indicate that timeouts might be more effective at preventing opponent's buildup of PM rather than thwarting PM after it has begun. Two findings supported this notion. In one instance, timeouts tended to be more effective when coaches used them while the score differential was small as opposed to when the margin was large (i.e., while the game is still within reach). In addition, timeouts tended to be more effective when coaches used them early in a scoring run as opposed to late in a scoring run (i.e., before the other team has gained momentum). Relatedly, strategic use of timeouts may be especially important in matches where the two teams competing are evenly matched, as indicated by score differential and consecutive points scored. Taken together, these findings offer some support for the strategy of using timeouts to interrupt and/or prevent the development of PM.

### *Limitations and future directions*

These results need to be considered in light of some limitations. For one, all data were based on retrospective archival data, so speculations about the causal effects of timeout need to be considered carefully. There are many factors that could lead to performance outcomes following timeouts, such as individual and team performance efficiency (e.g., Drikos et al., 2024; Sanjaykumar et al., 2024), coaching mastery in handling timeouts, coach-team dynamics (Huynh et al., 2020), and training that these data did not consider. Additionally, these data were taken from one season play from Women's NCAA Division I volleyball in the Big 10 Conference. This is considered to be one of the highest levels of women's volleyball within the United States. As such, these findings might not translate to other levels of play, such as in youth volleyball (where the base sideout rate is expected to be much lower) or international men's volleyball (where the base side out rate is expected to be much higher).

Another limitation is that statistical analyses did not control for the program strength of each team. Sideout rates for each team were compared to the conference average without consideration of that team's relative competitiveness within the conference. For example, it would be expected that teams playing at a lower level would have less chance of siding out than teams at a higher level. It is possible that less competitive teams are consistently taking more timeouts (i.e., against stronger teams) and so the measured sideout rate after timeouts is closer to that of lower-performance teams than an average for the conference. Using past tournament placements or winning percentage could provide a valid indication of program level.

Instances in which teams took two timeouts before one sideout were also uncontrolled for. In volleyball, each team has two timeouts per set, so it is possible that timeouts were nested within one scoring run for the serving team. These potential occurrences were not recorded in the data and it is possible that they carry nesting effects. Despite these limitations, the paper offers an interesting and practical examination of how timeouts could potentially influence psychological performance in competitive sporting competitions.

## CONCLUSION

Volleyball is a widely popular sport with more than 800 million participants worldwide. As such, research on coaching strategies involving the use of timeouts have implications for participants and the study of psychological momentum more broadly. The study's findings generally support the use of timeouts to curb psychological momentum. Timeouts appear to be able to reset teams back to their baseline line level, but do not help them exceed typical levels of performance generally. However, situational factors may modulate the effectiveness of timeout use. For example, timeouts taken earlier in a scoring run and when the score is close between the two opponents appear to be more effective. These findings have implications for how coaches might strategically employ timeouts to maximize team performance. However, further research is needed to replicate and extend these findings.

## AUTHOR CONTRIBUTIONS

Ho Phi Huynh: conceptualization, methodology, formal analysis, investigation, data curation, writing - original draft, writing - review and editing, visualization, supervision. Joel Goh: writing - original draft, writing - review and editing. William Condon: conceptualization. Kristin Layous: writing - review and editing.

## SUPPORTING AGENCIES

No funding agencies were reported by the authors.

## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

## DATA AVAILABILITY

The data that support the findings of this study are available upon reasonable request from the corresponding author.

## ACKNOWLEDGMENTS

Authors would like to gratefully acknowledge Kayla Waugh (McKissick) and Sean Hendrix for their efforts to code the data, and the Armstrong State Pirates and Club Savannah Volleyball teams for their inspiration during the project.

## REFERENCES

Bar-Eli, M., Avugos, S., & Raab, M. (2006). Twenty years of "hot hand" research: Review and critique. Psychology of Sport and Exercise, 7(6), 525-553. https://doi.org/10.1016/j.psychsport.2006.03.001

Briki, W., Den Hartigh, R. J., Markman, K. D., Micallef, J. P., & Gernigon, C. (2013). How psychological momentum changes in athletes during a sport competition. Psychology of Sport and Exercise, 14(3), 389-396. https://doi.org/10.1016/j.psychsport.2012.11.009

Cohen, J. (2016). A power primer. In A. E. Kazdin (Ed.), Methodological issues and strategies in clinical research (4th ed., pp. 279-284). American Psychological Association. https://doi.org/10.1037/14805-018

Den Hartigh, R. J., & Gernigon, C. (2018). Time-out! How psychological momentum builds up and breaks down in table tennis. Journal of Sports Sciences, 36(23), 2732-2737. https://doi.org/10.1080/02640414.2018.1477419

Drikos, S., Fatahi, A., Ahmed, S. A. D., Molavian, R., Giatsis, G., & Shakeri, A. (2025). A comparative analysis of volleyball skills in balanced sets for men and women in Asian competitions. Journal of Human Sport and Exercise, 20(1), 180-192. https://doi.org/10.55860/j7d91004

Gilovich, T., Vallone, R., & Tversky, A. (1985). The hot hand in basketball: On the misperception of random sequences. Cognitive Psychology, 17(3), 295-314. https://doi.org/10.1016/0010-0285(85)90010-6

Goldschmied, N., Nankin, M., & Cafri, G. (2010). Pressure kicks in the NFL: An archival exploration into the deployment of time-outs and other environmental correlates. The Sport Psychologist, 24(3), 300-312. https://doi.org/10.1123/tsp.24.3.300

Goldschmied, N., Raphaeli, M., & Morgulev, E. (2023). "Icing the shooter" in basketball: The unintended consequences of time-out management when the game is on the line. Psychology of Sport and Exercise, 68, 102440-102440. https://doi.org/10.1016/j.psychsport.2023.102440

Hsu, N.-W., Liu, K.-S., & Chang, S.-C. (2019). Choking under the pressure of competition: A complete statistical investigation of pressure kicks in the NFL, 2000-2017. PLOS ONE, 14(4), e0214096. https://doi.org/10.1371/journal.pone.0214096

Huynh, H. P., Johnson, C. E., & Wehe, H. (2020). Humble coaches and their influence on players and teams: The mediating role of affect-based (but not cognition-based) trust. Psychological Reports, 123(4), 1297-1315. https://doi.org/10.1177/0033294119839028

Iso-Ahola, S. E., & Dotson, C. O. (2014). Psychological Momentum: Why success breeds success. Review of General Psychology, 18(1), 19-33. https://doi.org/10.1037/a0036406

Mace, F. C., Lalli, J. S., Shea, M. C., & Nevin, J. A. (1992). Behavioral momentum in college basketball. Journal of Applied Behavior Analysis, 25(3), 657-663. https://doi.org/10.1901/jaba.1992.25-657

NCSA College Recruiting. (nd). Complete list of colleges with women's volleyball teams. Retrieved from [Accessed 2025, May 13]: https://www.ncsasports.org/womens-volleyball/colleges

Peter, N. (2024, August 11). History of volleyball: From humble beginnings to a global sport. Retrieved from [Accessed 2025, May 13]: https://olympics.com/en/news/what-history-volleyball-game-origin-mintonette-ymca-fivb-olympics

Raab, M., Gula, B., & Gigerenzer, G. (2012). The hot hand exists in volleyball and is used for allocation decisions. Journal of Experimental Psychology: Applied, 18(1), 81-94. https://doi.org/10.1037/a0025951

Roane, H. S., Kelley, M. E., Trosclair, N. M., & Hauer, L. S. (2004). Behavioral momentum in sports: A partial replication with women's basketball. Journal of Applied Behavior Analysis, 37(3), 385-390. https://doi.org/10.1901/jaba.2004.37-385

Sanjaykumar, S., Natarajan, S., Lakshmi, P. Y., Kalmykova, Y., Lobo, J., Pavlović, R., & Setiawan, E. (2025). Machine learning analysis for predicting performance in female volleyball players in India: Implications for talent identification and player development strategies. Journal of Human Sport and Exercise, 20(1), 207-215. https://doi.org/10.55860/cn2vdj44

Yaari, G., & Eisenmann, S. (2011). the hot (invisible?) hand: Can time sequence patterns of success/failure in sports be modeled as repeated random independent trials? PLoS ONE, 6(10), e24532. https://doi.org/10.1371/journal.pone.0024532