Review of "**Stage 2 Registered Report: Anomalous perception in a Ganzfeld condition - A meta-analysis of more than 40 years investigation**"

As indicated by the authors "The main aim of this study is to meta-analyse all available ganzfeld studies dating from 1974 up to December 2020 in order to assess the average effect size of the database with the more advanced statistical procedures that should overcome the limitations of the previous meta-analyses. Furthermore, we aim to identify whether there are moderator variables that affect task performance. In particular," […] the authors "hypothesize that participant type and type of task are two major moderators of effect size"

First, I must say that I appreciated the idea of including pre-communiqué studies in an overall meta-analysis of the 1974 to 2020 Ganzfeld data. Likewise, the added value of this meta-analysis also lies in its process-oriented approach consisting in testing the moderating effect of experience of participants and type of task. Of course, I had the same concerns as the other reviewers regarding the absence of study quality measure (see J Utts and S Schmidt comments). The authors replied that using peer-review level as a moderator and Year of publications as covariate would somehow address this issue. Although this is a makeshift as compared to using an explicit quality measure variable, I'm afraid that future researchers will have to introduce this quality measure in order to reanalyze the data while filtering out poor quality studies. In the meantime, the effect of study quality on the ES measures will be a sword of Damocles hanging over the findings of the present study.
Still, I think that the present research is very useful for the researcher interested in using Ganzfeld for the study of ESP. It provides a first useful approach with some effect size (ES) reference values. In order to go further one would need to adopt an approach such as Pooley et al (2023, doi: 10.31156/jaex.23878) investigation of moderator variables in post-communiqué telepathy ganzfeld studies.

Apart from a few issues regarding the rationale of the analyses (especially, in the Bayesian meta-analysis, the circular reasoning of introducing an ES prior value computed on the entire database, apparently), I have focused on the reproducibility of the analyses. For the various reasons I will develop, I recommend a major revision of the manuscript to address the comments raised below.

Statistical analyses replicability issues (using R code and JASP)

My first issue was to decide if the manuscript provided sufficient details to allow replication by others of the statistical analyses. In addition to the data files, the authors provide the R code that they used: in an R Markdown file (Stage 1 Syntax details.Rmd) that embeds explanatory text, and a companion word file (SyntaxDetailsStage1.docx).

I must say that I struggled (a lot) to replicate the analysis **using the R code provided by the authors**. First, because I relied initially on the word file, that apparently contains a few typos here and there (such as missing "$" and erroneous commands) that did not allow for straightforward execution of the code. Then, because the Rmd file also contained similar errors although it included some commands missing in the docx file.

Appendix 1 at the end of this my report contains a non-exhaustive list of such errors, as well as questions and suggestions for the manuscript revision. Some of the R ode errors are minor; some are major, such as erroneous parameter values in some functions. Appendix 1 also contains the output of a JupyterNotebook file that I used to test the R code. N.B. I used csv file with 4 decimal rounding of the initial values from the xlsx data file provided by the authors, but I double checked some computations after importing the xlsx file in R Studio.

Here are some comments and questions, not necessarily related to errors in the code:

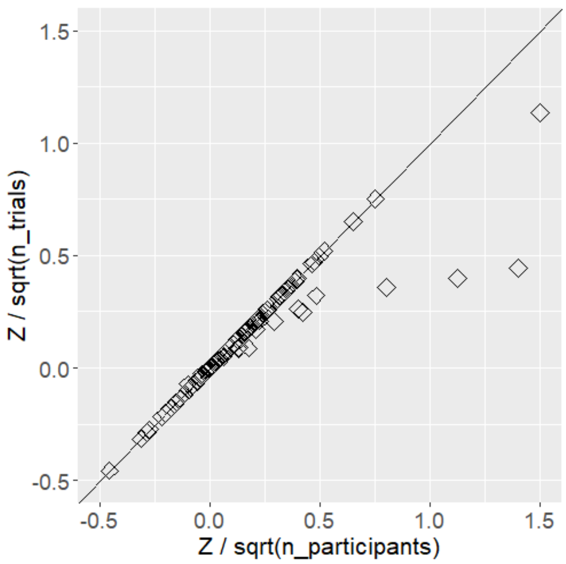
- Effect size measures

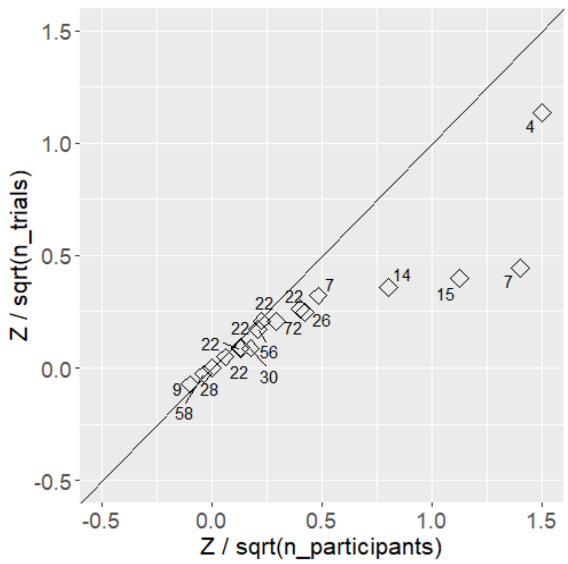
About the Z/√*N* measure, please quote the first authors to use this effect size measure for the purpose of psi research meta-analyses (Milton & Wiseman, 1999, or before??). In addition, I think that it might be interesting to remind the rationale behind this formula for novice readers: according to Rosenthal (*Meta-analytic procedures for social research*, 1991, Table 2.1), *Test of significance = Size of effect* x *Size of Study*. For *Z*, it corresponds to *Z = Size of effect* x √*N*. Therefore, Z/√*N* is a measure of the *Size of effect*.

At the beginning of the "Effect size measures" section, the authors write "As standardized measure of effect size, we used […] Binomial Z score/√number of trials using the number of trials, the hits score and the chance probability as raw scores." However, in the xlsx data file provided by the authors, the values in the ES column correspond to *Z/√N, with N* as the number of participants rather than the number of trials in study. Indeed, later in in same section, they indicate that the formula was: "The standardized effect size was computed applying the formula *Z/√N* of participants."
So, why did the authors indicate at the very beginning of the same section, that they used "Binomial Z score/√number of trials"? This is very confusing. Please, correct.

I wonder why the authors went from "Z score/√number of trials" (in previous meta-analyses) to "Z/√N of participants". Please, explain.

In fact, most of the studies had equal number of participant and trials (see the point on the diagonal line in the Figure left panel below), with the exception of 17 studies where the number of trials was greater than the number of participants. Unfortunately, for positive *Z* scores, when the number of trials is greater than the number of participants, the *Z score/√number of participants* formula tends to inflate the ES values as compared to *Z score/√number of trials,* as illustrated in the Figure right panel below (with Study number labels). Please, say something about this problem.





After, in the "Effect size measures" section, authors provide the formula for SE of effects size:
"As standard error, we used the formula: √(hit rate % * (1-hit rate %)/participants * chance percentage *(1-chance)percentage))".
Note that the authors used proportions (varying between 0 and 1) and not percentages (possibly varying between 0 and 100, here). Please, correct the formula.

I also share the concerns expressed earlier by S Schmidt and J Utts about using webpages to compute exact binomial Z score values, either directly (with http://vassarstats.net/binomialX.html) or indirectly (with http://www.fourmilab.ch/rpkp/experiments/analysis/zCalc.html from the *p* value provided by *binomialX.html*). First, regarding the computation performed by *zCalc.html*, one can have exactly the same results for calculating a Z score from a given *p-value* using the R function: `qnorm(p-value, 0, 1, lower.tail=FALSE)`. No need to use *zCalc.html*. Similarly, the values computed by the *binomialX.html* app can be computed in R using the `binom.test()` function. In fact, in Appendix 2 at the end of this review, I provide details of the R code that computes the Z scores without using any webpage, with examples for the first four studies of the GZ 1974-2020 database.
For comparison, I first tried to replicate the results for those four studies, with the webpages used by authors, and was able to replicate the Z score they provide in their data file, except for study 3. In the later case, *binomialX.html* computed a binomial Z = -0.91, that the authors did not use. Instead, they used the '*Method 2. approximation via normal*' *p*-value provided by *binomialX.html* and then computed the Z value with *zCalc.html,* that is Z = -1.28, which is a more conservative value that runs counter to the psi phenomena hypothesis. Can the authors explain why they made this choice, given that they wrote that that would use the Z values provided by *binomialX.html,* if any?

To avoid introducing discrepancies into the computations, I recommend being more systematic by using an R code, such as the one in Appendix 2. This would allow for more transparent and easier analysis replication.

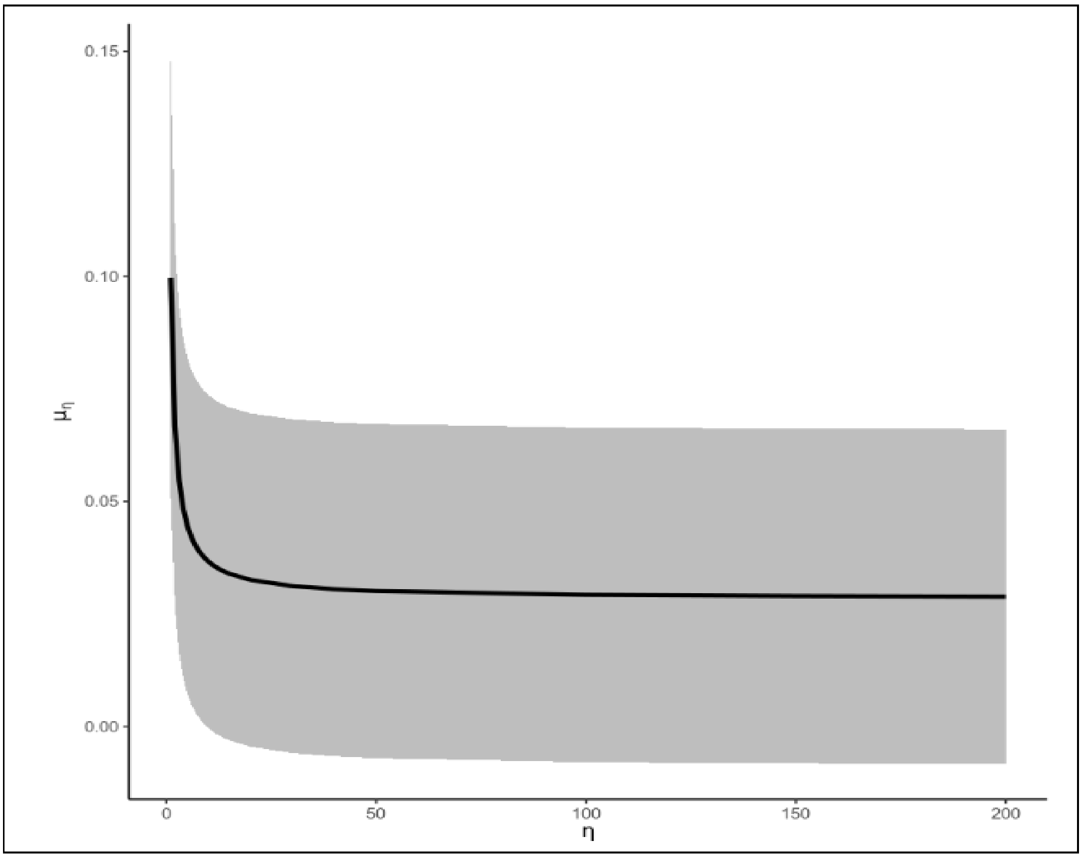
- Hit rate

Table 1 reports several descriptive values. The mean (SD) values in the Hit rate column are for 4 free-choice designs. However, the corresponding note at the bottom of Table "this value is purely descriptive because not all studies are 4 free-choice designs" is ambiguous; it is unclear if the mean is for all the studies among which 4 free-choice designs, or only the studies using 4 free-choice designs. Please, rephrase into "this value was computed on the basis of studies (n = 109) using only 4 free-choice designs."

- Publication Bias tests

The authors write: "The results of the sensitivity analysis publication bias to shift the observed effect size point estimate to the .01 level, considered the smallest effect size of interest, indicated that no amount of publication bias (parameter eta) under the assumed model would suffice to shift the point estimate to this level."
On the one hand, I find this statement incomplete and misleading because it ignores the confidence interval around the meta-analytic pooled point estimate. If one examines the sensitivity plot corresponding to the authors database, as illustrated in the figure below using the `PublicationBias` library R code provided by the authors (once some errors were corrected, see Appendix 1), one can notice that the point estimate lower CI limit includes zero for η = 10 (and includes 0.01 for η = 5). See Appendix 1 for the table with the actual estimate point values as a function of each eta value. These results suggest that for publication bias to attenuate (to "explain away") the observed point effect lower CI interval to the null, affirmative results would need to be at least 10 fold more likely to be published than nonaffirmative results. Interestingly, although such small values suggest that the meta-analysis is relatively sensitive to publication bias, both the η = 5 and η = 10 values (for which the point estimate lower CI limit includes 0.01 and zero, respectively) fall within the range of the 95% CI of the estimate of publication bias computed by Mathur and VanderWeele (2020) on the basis of 17 meta-analyses from top psychology journals ($\hat{\eta}$ = 4.70, 95% CI [1.94, 11.34]). Moreover, the η = 10 value is consistent the fail-safe number computed with `fsn(yi=yi, sei=sei, data=data, type="Rosenthal", alpha=.05)` of the `metafor` library, using the Rosenthal method (i.e., 'file

drawer analysis'). This computation shows that 1626 studies averaging null results would have to be added to the GZ1974-2020 dataset to reduce the combined significance level to the 0.05 alpha level. These 1626 studies represent 12.3 times the number of studies (n =133) in the dataset.



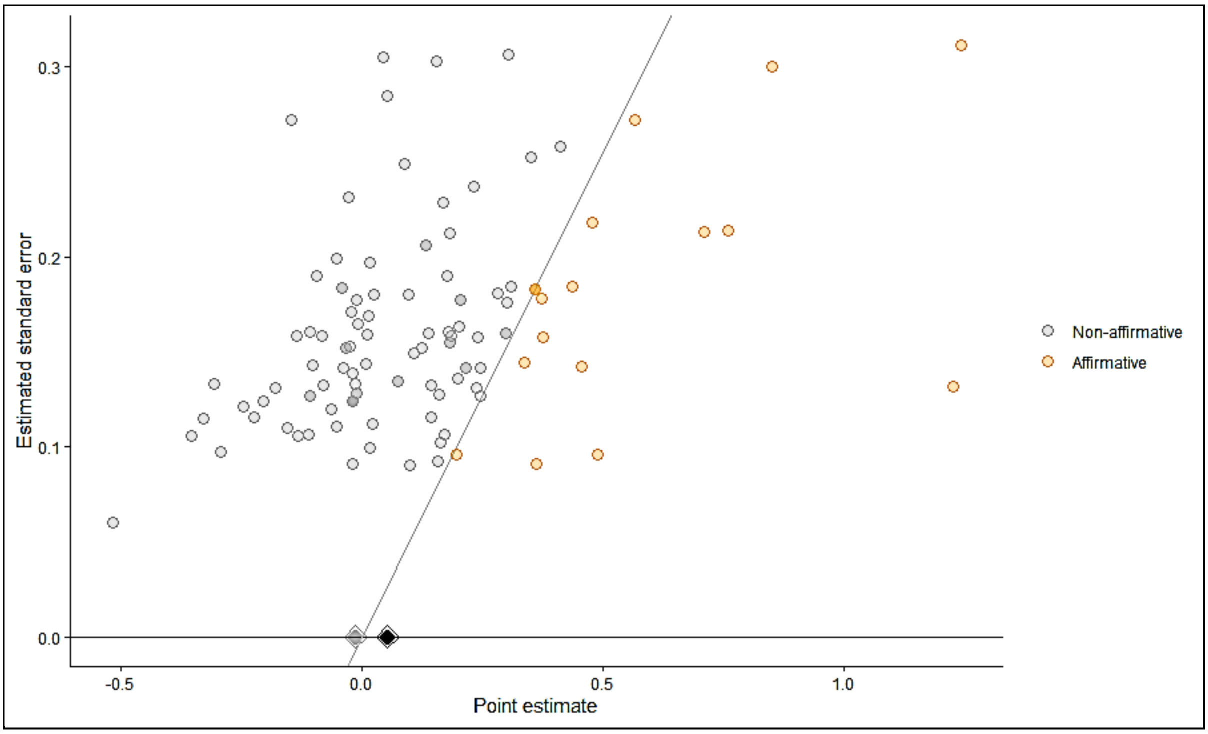
On the other hand, authors considerably underutilize the possibilities offered by the sensitivity analysis and the `PublicationBias` library (Mathur & VanderWeele, 2020). I urge the authors to show and interpret the **significance funnel plot** corresponding to their meta-analytic database.

According to Mathur & VanderWeele (2020, p. 1100):

> "the significance funnel helps to detect the extent to which the non-affirmative studies' point estimates are systematically smaller than the entire set of point estimates, which is the more relevant consideration when publication bias operates on statistical significance. The significance funnel distinguishes visually between affirmative studies (points to the right of the line) and non-affirmative studies (points to the left of the line) and also displays the point estimates within all studies (the black diamond) and within only the non-affirmative studies (the grey diamond). As discussed above, the latter represents the corrected estimate for worst-case publication bias under the model assumed. Thus, as a simple heuristic, when the diamonds are close to one another, our quantitative sensitivity analyses will typically indicate that the meta-analysis is fairly robust to publication bias. When the diamonds are distant or if the grey diamond represents a negligible effect size, then our sensitivity analyses may indicate that the meta-analysis is not robust.

The figure below represents the significance funnel plot that I computed using the data file provided by the authors, with the following R code:

```
yi=data$ESg
vi=data$SEg^2
significance_funnel(yi = yi, vi = vi, favor_positive = TRUE)
```



Given that the grey diamond (point estimate within only the non-affirmative studies) represents a negligible effect size and goes in the unexpected direction, the sensitivity analysis suggests that the meta-analysis is not robust. Accordingly, publication bias that favors affirmative results could potentially attenuate the meta-analytic estimate considerably.

Finally, could the authors give a reference or spell out the practical (or theoretical) reasons for this statement: "the .01 level, considered the smallest effect size of interest"? For example, according to Lakens (2017, DOI: 10.1177/1948550617697177) the smallest effect size of interest (SESOI) could be a positive or negative difference of Cohen's *d* = 0.3). On what practical (or theoretical) grounds would a given *Z*/√*N* value be an SEOI for GZ studies (see also, Lakens 2014 for a discussion of SESOIs, DOI: 10.1002/ejsp.2023)?

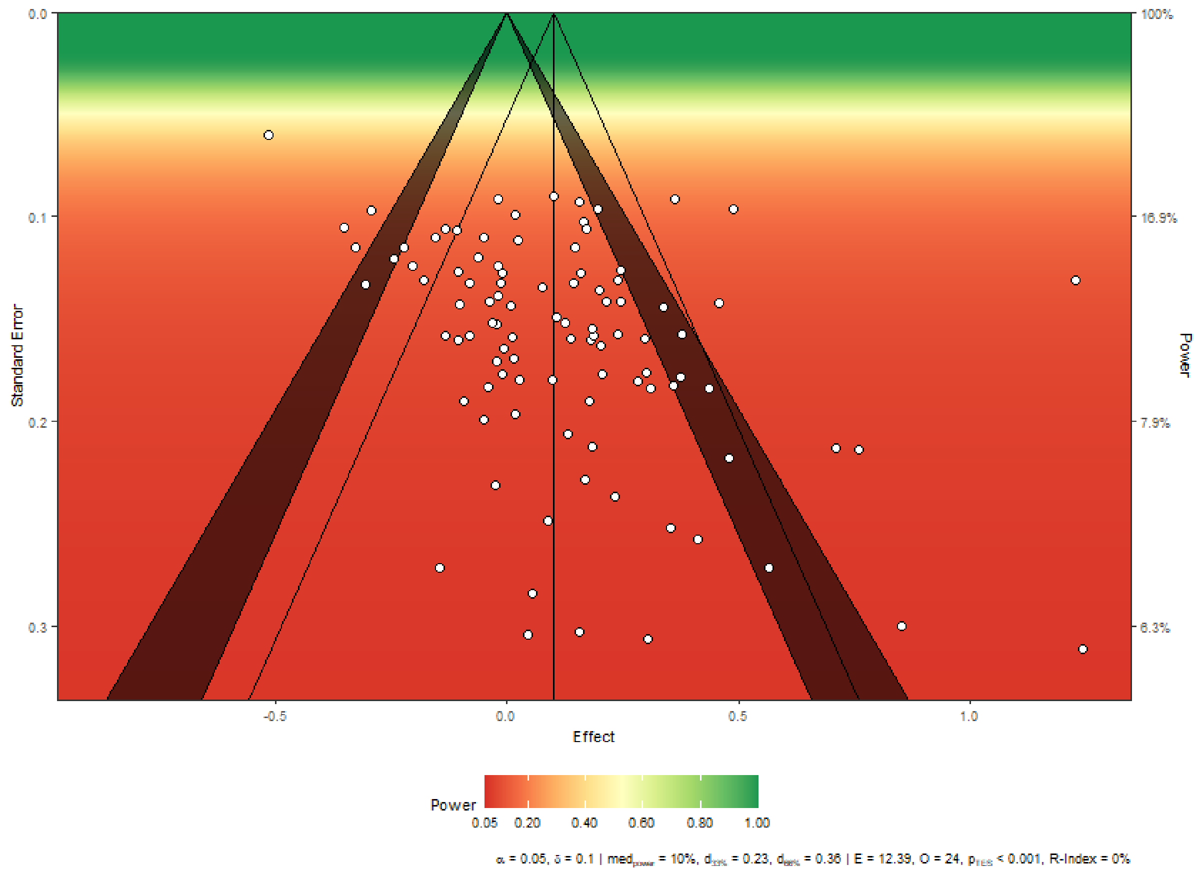
Figures

The manuscript mentions several supplementary figures that are not currently available at the Figshare link the authors provided (doi: 10.6084/m9.figshare.12674618.v11), neither in a docx file nor as separate figure files (e.g., PNG, PDF, etc). These figures should be included in the manuscript, rather than in a supplementary addendum.

- *"The forest plot is available as Figure S1"* ("Pooled estimate of the average effect" section). I could not determine if it corresponded to the figure generated by the `plot_forest()` function using `library(metaBMA)` in the "#BAYESIAN M-A" R code section. I guess that it is not the case because Figure S1 is mentioned at the beginning of the Results section. I wondered if the forest plot was in the JASP file provided by the authors, given that it could be generated using the "Classical Meta-Analysis" module, but it was not the case (the authors did not use JASP for Classical Meta-Analysis).
- *"The results of the cumulative meta-analysis is represented with a cumulative forest plot in Figure S2"* ("Cumulative effect size" section). I guess that it corresponds to the figure generated by the "cumulative forest plot" R code provided by the authors.

- Figures S3 and S4 are available in the JASP file, as mentioned by the authors.

Unforfunately, the authors do not provide any **funnel plot** figure. I recommend the authors to use the `metaviz` R library to generate a funnel plot with power regions, such as the one below corresponding to authors' dataset (see details of the corresponding R code in Appendix 1). This kind of figure would fit well in the Results "Statistical power" subsection.



According to `metaviz` manual: "*Colored regions of different power levels and a second axis with study level power are shown in the funnel plot. In addition, power-related statistics are shown: a) The median power of all studies, b) the true effect size necessary such that the median power of the studies would have been 33% or 66%, c) results of a test of excess significance (Ioannidis & Trikalinos, 2007), and d) the R-Index for expected replicability (Schimmack, 2016).*"

Rationale of the statistical analysis and Discussion of the results

I must confess that, while I appreciate Bayesian approaches (in spite of Bayes factor hacking, Konijn et al 2015, doi : 10.1080/19312458.2015.1096332), I tend to prefer fiducial Bayesian approaches (e.g., Lecoutre & Poitevineau 2014 DOI : 10.1007/978-3-662-44046-9); but they are not yet commonplace in meta-analysis. That said, I was very surprised by the way the authors used priors in the Bayesian Meta-Analysis.
The authors write "As priors for the average effect size we used a normal distribution with Mean = 0.1; SD = 0.03, constrained positive, lower bound = 0 (Haaf & Rouder, 2020), given our expectation of a positive value". As far as I understand, the authors used "0.1" as a prior of the ES under study, based on previously meta-analyses conducted on part of the database they examined. Such as Storm & Tressoldi (2020) for the studies published from 2008 to 2018, or Storm et al. (2010) meta-analysis of 29 ganzfeld studies published during the period 1997 to 2008. Surprisingly, they never clearly write down (or maybe I missed something?) that the theoretical GZ effect size would be "$Z/\sqrt{N} = 0.1$".

Following Bem, Utts, and Johnson (2011, DOI: 10.1037/a0024777), one should use: « "knowledge-based" prior because it reflects what we already know about effect sizes typically observed in psychological research, including previous psi research » (p.717). In other words, priors (whether for ES or the standard error of ES) should be based on results from earlier studies. Unfortunately, setting a "$Z/\sqrt{N} = 0.1$" prior based on studies that are already included in the meta-analysis of interest is somehow a circular reasoning.
Personally, I would have conducted the analyses differently: starting with a classical meta-analysis on the 1974-1986 "pre-communiqué" studies in order to compute the ES and SE values for $Z/\sqrt{N}$, and then I would have conducted a Bayesian meta-analysis on the 1987-2020 "post-communiqué" studies based on the pre-communiqué ES and SE. Of course, this may be somehow problematic for testing the "Task" effect because "telepathic GZ" was the only task used in the pre-communiqué period, but "of two evils, choose the least" (the evils being "losing the based-on-previous-studies priors" versus "losing the Task factor").

Miscellaneous

I invite the authors to present and discuss (as an exploratory analysis since it was not planned in Stage 1) the results for the weighted least squares (WLS) meta-analysis, available in JASP WAAP-WLS module (see the table, below). Indeed, Stanley & Doucouliagos (2013, doi10.1002/sim.6481) showed that "unrestricted weighted least squares estimator is superior to conventional random-effects meta-analysis when there is publication (or small-sample) bias and better than a fixed-effect weighted average if there is heterogeneity". Given that the authors set the SESOI at $Z/\sqrt{N}$ = 0.01, the WLS estimate $Z/\sqrt{N}$ = 0.055 is greater than the SESOI value.
Interestingly, I found that the WLS estimate for pre-communiqué studies (before 1987) was $Z/\sqrt{N}$ = 0.008 (p = 0.918) and 95% CI = [-0.15 ; 0.17], whereas the WLS estimate for post-communiqué studies (after 1986) was $Z/\sqrt{N}$ = 0.069 (p = 0.0017) and 95% CI = [0.027 ; 0.11]. These results show stronger evidence of psi phenomena in post-communiqué studies.

Mean Estimates (μ) ▼

						95% Confidence Interval	
	Estimate	Standard Error	t	df	p	Lower	Upper
WLS	0.05531	0.02552	2.16683	112	0.03237	0.00528	0.10533

APPENDIX 1

Here, is a possibly non-exhaustive list of errors and issues in the R code provided by the Authors:

- **"Weighted median analysis" section**

  `beta.in <- data$ESpid` is missing in the docx file, but available in the Rmd file but this command contains an error since there is no `ESpid` variable in the data file, the correct command should be `beta.in <- data$ESg`

  Likewise, the next `se.in<-sqrt(data$Varpi)` command did not work. Because there is no `data$Varpi` variable in the data file, instead the correct command should be `se.in<-data$ESg`

- **Statistical Power analysis**

The `mapower_se` function of Quintana's `metameta` R package calculates study-level statistical power for a range of effect sizes.

The observed ES value used in the script provided by the authors is not correct

```
power_ma <- mapower_se( dat = data, observed_es = 0.178, name = "GZ 1974-2020")
```

it corresponds to the example value given on Quintana's https://github.com/dsquintana/metameta and in his 2023 paper (see page 5 of DOI: 10.1177/25152459221147260) introducing `metameta`. This value is taken from "a meta-analysis of nine studies that investigated the impact of intranasal oxytocin administration on social cognition in autism spectrum disorders (Ooi et al., 2017)" (Quintana, 2023, p. 5). Nothing to do with psi phenomena.

I guess that the value should be `observed_es = 0.099` if the authors rely on their Table 2 Frequentist weighted ES = .099

Moreover the above command line, generate the following error message :

```
Error in stats::pnorm(stats::qnorm(1 - 0.05/2) * dat[["sei"]], abs(observed_es),  :   Non-numeric argument to mathematical function
```

meaning that the data file needs a "sei" column.

Therefore, the following columns need to be added earlier in the script:

```
data$yi=data$ESg
data$sei<- data$SEg
```

- **Publication Bias tests**

  "p-uniform, from Correcting for Publication Bias in a Meta-Analysis" section

  The `puni_star(yi = data$ES, vi = data$VAR, side="right", method="ML", alpha=0.1)` code generated a message error :

```
Error in sqrt(vi) : non-numeric argument to mathematical function
In addition: Warning message:
Unknown or uninitialised column: `VAR`.
```

  It happens that was a case sensitive issue, so I replaced `data$VAR` with `data$Var` but then another error message appeared:

```
Error in if (get_LR_tau(prof.tau = 0, yi = yi, vi = vi, est = est, tau.est = tau
.est,  :   missing value where TRUE/FALSE needed
```

I struggled, struggled, and found a possible reason for the problem: a zero value in `data$Var` for the Child & Levi (1979) study. I filtered out the Child & Levi (1979) study and then it worked (see details in *Tressoldi&Storm2023 - GZ19742020 - Jupyter Notebook.pdf*). However, I found a p-uniform* (`puni_star`) ES estimate = 0.13 and 95% CI = [0.07 ; 0.20]
which did not correspond to **what the authors reported in Table 3, i.e.,**
p-uniform* ES estimate = 0.18 and 95% CI = [0.10 ; 0.26]

Then, I tried again after changing the alpha level from 0.1 to 0.05, with the new `data2` file that did not include Child & Levi (1979) study

```
puni_star(yi = data2$ES, vi = data2$Var, side="right", method="ML",
alpha=0.05)
```

and obtained p-uniform* ES estimate = 0.21 and 95% CI = [0.12 ; 0.34]
Again, results differing from those reported by the authors.

Then I reloaded the original `data` file, and replaced the zero value for the `data$Var` Child & Levi (1979) study with a close-to-zero value (namely 0.001 instead of 0) which gave
p-uniform* ES estimate = 0.15 and 95% CI = [0.08 ; 0.25] for `alpha=0.1`
and p-uniform* ES estimate = 0.21 and 95% CI = [0.12 ; 0.34] for `alpha=0.05`

I scratched my head, again and again, and then after a while, I tried :

```
puni_star(yi = data$ESg, vi = data$SEg^2, side="right", method="ML", alp
ha=0.1)
```

which gave as a result p-uniform* ES estimate = 0.18 and 95% CI = [0.10 ; 0.30] for `alpha=0.1`
much closer to what the authors reported !! Because I was working with CSV file with a 4 decimal rounding of the XLSX file values (in a JupyterNotebook). I tried again while importing the XLSX file in R Studio and the results were much closer to what the authors reported
p-uniform* ES estimate = 0.18 and 95% CI = [0.10 ; 0.27] for `alpha=0.1`

After all this quest, I guess that the authors used `yi = data$ESg` and `vi = data$SEg^2` instead of what they wrote in their R code (namely, `yi = data2$ES, vi = data2$Var)`.
Could the authors share the solution they adopted, and modify the code they provide accordingly?

“ Sensitivity analysis for publication bias in meta-analyses” section

Mentioning `library(PublicationBias)` at the very beginning of the corresponding code lines would help.

The code provided by the authors does not work. One of the reasons is due to `ymin = lo, ymax = hi` in the following line :

```
geom_ribbon( data = res.df, aes( x = eta, ymin = lo, ymax = hi ), fill =
"gray" )
```

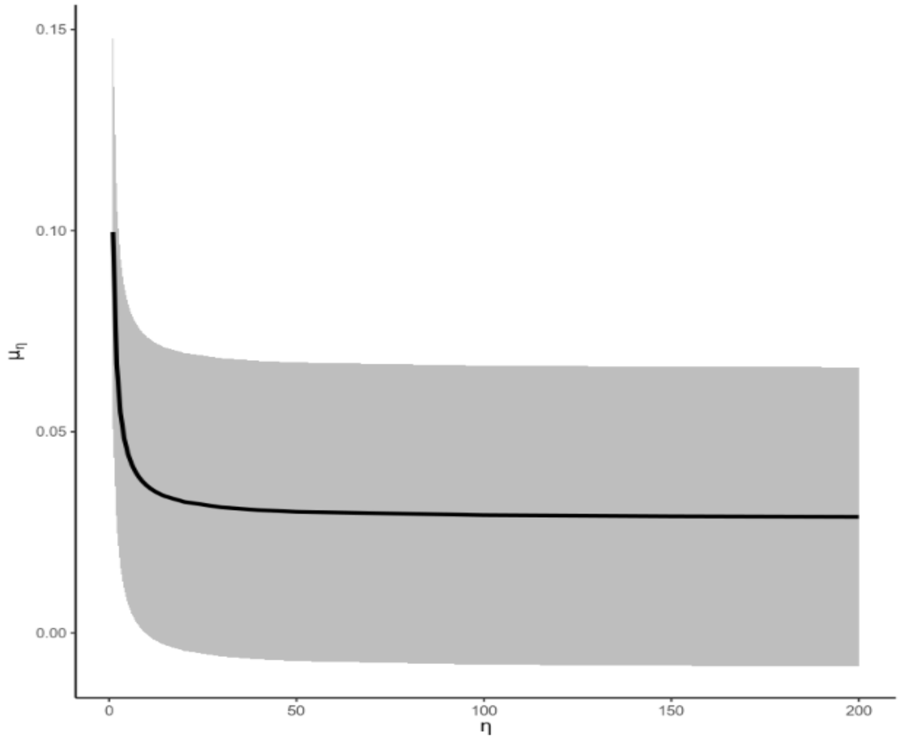
```r
eta.list = as.list( c( 200, 150, 100, 50, 40, 30, 20, rev( seq(1,15,1) ) ) )
res.list = lapply( eta.list, function(x) {
        cat("\n Working on eta = ", x)
        return( corrected_meta( yi = yi,
                                vi = vi,
                                eta = x,
                                model = "robust",
                                favor.positive = T,
                                small=T
                                ) )
}
)

res.df = as.data.frame( do.call( "rbind", res.list ) )
```

```r
require(ggplot2)
ggplot( data = res.df, aes( x = eta, y = est ) ) +

        geom_ribbon( data = res.df, aes( x = eta, ymin = lo, ymax = hi ), fill = "gray" ) +

        geom_line( lwd = 1.2 ) +
        xlab( bquote( eta ) ) +
        ylab( bquote( hat(mu)[eta] ) ) +

        theme_classic()
```

I rewrote the code into:

```r
##### Make sensitivity plot as in Mathur & VanderWeele (2020) #####
# range of parameters to try (more dense at the very small ones)
selection_ratios <- c(200, 150, 100, 50, 40, 30, 20, seq(15, 1))

# compute estimate for each value of selection_ratio
estimates <- lapply(selection_ratios, function(e) {
pubbias_meta(yi = yi, vi = vi,
selection_ratio = e, model_type = "robust",
favor_positive = TRUE)$stats
})
estimates <- dplyr::bind_rows(estimates)
estimates$selection_ratio <- selection_ratios


require(ggplot2)
ggplot(estimates, aes(x = selection_ratio, y = estimate)) +
geom_ribbon(aes(ymin = ci_lower, ymax = ci_upper), fill = "gray") +
geom_line(lwd = 1.2) +
labs(x = bquote(eta), y = bquote(hat(mu)[eta])) +
theme_classic()
```

The new code generated the following figure:



...and the `estimates` command generated the following table :

model	estimate	se	ci_lower	ci_upper	p_value	selection_ratio
<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
pubbias	0.02885574	0.01869559	-0.0083255331	0.06603702	1.265014e-01	200
pubbias	0.02899443	0.01869165	-0.0081789911	0.06616786	1.246350e-01	150
pubbias	0.02927157	0.01868401	-0.0078866529	0.06642980	1.209737e-01	100
pubbias	0.03010110	0.01866314	-0.0070155709	0.06721778	1.105455e-01	50
pubbias	0.03051481	0.01865384	-0.0065833435	0.06761296	1.056340e-01	40
pubbias	0.03120276	0.01864002	-0.0058678294	0.06827334	9.787685e-02	30
pubbias	0.03257282	0.01861855	-0.0044548267	0.06960047	8.387766e-02	20
pubbias	0.03393516	0.01860512	-0.0030654497	0.07093577	7.172801e-02	15
pubbias	0.03432299	0.01860273	-0.0026727548	0.07131874	6.856835e-02	14
pubbias	0.03476972	0.01860076	-0.0022219761	0.07176141	6.508409e-02	13
pubbias	0.03528985	0.01859952	-0.0016992006	0.07227889	6.122912e-02	12
pubbias	0.03590310	0.01859950	-0.0010856873	0.07289189	5.695107e-02	11
pubbias	0.03663694	0.01860153	-0.0003555736	0.07362945	5.219206e-02	10
pubbias	0.03753082	0.01860698	0.0005278625	0.07453377	4.689174e-02	9
pubbias	0.03864349	0.01861830	0.0016185715	0.07566840	4.099503e-02	8
pubbias	0.04006648	0.01864002	0.0029991844	0.07713377	3.446987e-02	7
pubbias	0.04195066	0.01868105	0.0048030126	0.07909831	2.734555e-02	6
pubbias	0.04456359	0.01876048	0.0072600369	0.08186714	1.979090e-02	5
pubbias	0.04842942	0.01892400	0.0108044213	0.08605442	1.225974e-02	4
pubbias	0.05473350	0.01929985	0.0163689905	0.09309801	5.690338e-03	3
pubbias	0.06684512	0.02034591	0.0264214659	0.10726878	1.454735e-03	2
pubbias	0.09964273	0.02452292	0.0509769240	0.14830854	9.774728e-05	1

- **“Bartoš F, Maier M RoBMA: An R Package for Robust Bayesian Meta-Analyses. R package version 1.0.4, (2020)” section**

I happens that the installation of RoBMA in R Studio does not work well. It requires the `rjags` package, which is a nightmare to install. I guess that the authors used RoBMA within the JASP software. If so, they’d better delete the R code they provided for RoBMA, and mention that they used JASP, as it seems to be the case if one examines the JASP file provided by the authors.

```
> install.packages("RoBMA")
WARNING: Rtools is required to build R packages but no version of Rtools compa
tible with the currently running version of R was found. Note that the followi
ng incompatible version(s) of Rtools were found:

  - Rtools 3.1 (installed at C:\Program Files\R\R-3.1.0\Rtools)

Please download and install the appropriate version of Rtools before proceedin
g:

https://cran.rstudio.com/bin/windows/Rtools/
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.3/RoBMA_3.1.0.zip'
Content type 'application/zip' length 1474130 bytes (1.4 MB)
downloaded 1.4 MB

package ‘RoBMA’ successfully unpacked and MD5 sums checked

The downloaded binary packages are in
	C:\Users\mamorim\AppData\Local\Temp\RtmpERve8d\downloaded_packages

> library(RoBMA)
Loading required namespace: runjags
Loading required namespace: mvtnorm
Error: package or namespace load failed for ‘RoBMA’:
 .onLoad failed in loadNamespace() for 'RoBMA', details:
  call: NULL
  error: .onLoad failed in loadNamespace() for 'rjags', details:
  call: fun(libname, pkgname)
  error: Failed to locate any version of JAGS version 4

The rjags package is just an interface to the JAGS library
Make sure you have installed JAGS-4.x.y.exe (for any x >=0, y>=0) from
http://www.sourceforge.net/projects/mcmc-jags/files
```

In sum, replicating the analyses performed by the authors with the provided details was no walk in the park. Still, I’m rather confident that a revised version with more accurate details will help future readers…

Syntax related to the paper "Tressoldi, P. & Storm, L. Anomalous perception in a Ganzfeld condition: A meta-analysis of more than 40 years investigation

In [1]:
```
data <- read.csv("GZMADatabase1974_2020_data.csv", sep=";")
```

In [2]:
```
data
```

A data.frame: 113 × 22

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
1	Journal	1	Honorton & Harper	1974	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18
2	Journal	1	Braud, Wood & Braud	1975	10	10	3	0.17	6	⋯	0.759	0.24002	0.1510	0.3885	0.1543	0.30
3	RIP - Article	3	Palmer & Aued	1975	40	40	7	0.25	4	⋯	-1.280	-0.20239	0.0181	0.1347	-0.2217	0.11
4	RIP - Article	3	Honorton	1976	4	7	6	0.25	4	⋯	3.000	1.50000	0.1633	0.4041	1.2273	0.13
5	RIP - Article	3	Rogo	1976	28	28	8	0.25	4	⋯	0.220	0.04158	0.0389	0.1972	0.0135	0.16
6	Journal	1	Rogo, Smith & Terry	1976	20	20	7	0.25	4	⋯	0.770	0.17218	0.0607	0.2463	0.1322	0.20
7	Journal	1	Terry & Honorton - exp1	1976	12	27	11	0.25	4	⋯	1.670	0.48209	0.1073	0.3276	0.4123	0.25
7	Journal	1	Terry & Honorton - exp2	1976	6	60	27	0.25	4	⋯	3.430	1.40029	0.2200	0.4690	1.2424	0.3
8	Journal	1	Palmer, Bogart, Jones & Tart	1977	30	30	7	0.25	4	⋯	-0.031	-0.00566	0.0318	0.1783	-0.0317	0.15
9	Journal	1	Wood, Kirk & Braud	1977	24	48	10	0.25	4	⋯	-0.500	-0.10206	0.0367	0.1914	-0.1350	0.15
10	RIP - Article	3	York	1977	49	49	19	0.20	5	⋯	2.750	0.39286	0.0300	0.1731	0.3772	0.15
11	Journal	1	Schmitt & Stanford	1978	20	20	12	0.25	4	⋯	3.360	0.75132	0.0640	0.2530	0.7113	0.21
12	Journal	1	Child & Levi	1979	14	14	0	0.20	5	⋯	-1.710	-0.45702	0.0000	0.0000	-0.5158	0.06
13	Journal	1	Palmer, Khamashta & Israelson	1979	20	20	2	0.25	4	⋯	-1.290	-0.28845	0.0240	0.1549	-0.3285	0.11
14	Journal	1	Sondow	1979	20	100	41	0.25	4	⋯	3.580	0.80051	0.0645	0.2540	0.7605	0.21
15	Journal	1	Ashton, Dear, Harley & Sargent	1981	4	32	14	0.25	4	⋯	2.250	1.12500	0.3281	0.5728	0.8523	0.30

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
16	RIP - Article	3	Sargent, Harley, Lane & Radcliffe	1981	40	40	11	0.25	4	⋯	0.180	0.02846	0.0266	0.1630	0.0091	0.14
17	RIP - Article	3	Sondow, Braud & Barker	1981	40	40	13	0.25	4	⋯	0.910	0.14388	0.0293	0.1710	0.1245	0.15
18	Journal	1	Sargent	1982	20	20	7	0.25	4	⋯	0.770	0.17218	0.0607	0.2463	0.1322	0.20
19	RIP - Article	3	Sargent, Bartlett & Moss	1982	32	32	9	0.25	4	⋯	0.200	0.03536	0.0337	0.1836	0.0110	0.15
20	RIP - Article	3	Braud, Ackles & Kyles	1984	10	10	6	0.25	4	⋯	2.060	0.65143	0.1280	0.3578	0.5657	0.27
21	Journal	1	Haraldsson & Gissurarson	1985	70	70	19	0.25	4	⋯	0.280	0.03347	0.0151	0.1227	0.0226	0.11
22	Journal	1	Honorton - exp1	1983	19	22	8	0.25	4	⋯	0.980	0.22483	0.0650	0.2549	0.1826	0.21
22	Journal	1	Honorton - exp2	1984	4	9	3	0.25	4	⋯	0.255	0.12750	0.2963	0.5443	-0.1452	0.27
22	Journal	1	Honorton - exp3	1986	24	35	10	0.25	4	⋯	0.290	0.05920	0.0454	0.2130	0.0262	0.18
22	Journal	1	Honorton - exp101	1984	50	50	12	0.25	4	⋯	-0.028	-0.00390	0.0195	0.1395	-0.0193	0.12
22	Journal	1	Honorton - exp102	1985	50	50	18	0.25	4	⋯	1.630	0.23052	0.0246	0.1568	0.2151	0.14
22	Journal	1	Honorton - exp103	1987	50	50	15	0.25	4	⋯	0.650	0.09192	0.0224	0.1497	0.0765	0.13
22	Journal	1	Honorton - exp104/105a	1986	36	36	12	0.25	4	⋯	0.960	0.16000	0.0329	0.1814	0.1384	0.15
22	Journal	1	Honorton - exp104/105b	1988	20	20	10	0.25	4	⋯	2.320	0.51877	0.0667	0.2582	0.4788	0.21
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋱	⋮	⋮	⋮	⋮	⋮	
57	Proceedings	2	Morris, Summers & Yim	2003	40	40	15	0.25	4	⋯	1.640	0.25931	0.0313	0.1768	0.2400	0.15

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
58	Journal	1	Goulding, Westerlund, Parker & Wackermann	2004	64	128	30	0.25	4	⋯	-0.310	-0.03875	0.0150	0.1223	-0.0507	0.11
59	Journal	1	Lau, Howard, Maxwell, & Venter	2009	120	120	36	0.25	4	⋯	1.160	0.10589	0.0093	0.0966	0.0996	0.09
60	Journal	1	Roe, Sherwood & Holt - no sender	2004	17	17	4	0.25	4	⋯	-0.186	-0.04511	0.0564	0.2376	-0.0927	0.19
60	Journal	1	Roe, Sherwood & Holt - sender	2004	23	23	6	0.25	4	⋯	0.120	0.02502	0.0447	0.2115	-0.0095	0.17
61	Journal	1	Stevens	2004	50	50	12	0.25	4	⋯	-0.027	-0.00382	0.0195	0.1395	-0.0192	0.12
62	Journal	1	Parra & Villanueva - visual	2004	54	54	25	0.25	4	⋯	3.460	0.47085	0.0246	0.1567	0.4566	0.14
62	Journal	1	Parra & Villanueva - auditory	2004	54	54	19	0.25	4	⋯	1.570	0.21365	0.0225	0.1501	0.1994	0.13
63	Journal	1	Sherwood, Roe, Holt & Wilson	2005	38	38	8	0.25	4	⋯	-0.370	-0.06002	0.0233	0.1527	-0.0804	0.13
64	Journal	1	Parra & Villanueva	2006	138	138	57	0.25	4	⋯	4.320	0.36774	0.0094	0.0968	0.3623	0.09
65	Journal	1	Putz, Glasser & Wackermann	2007	120	120	39	0.25	4	⋯	1.790	0.16340	0.0098	0.0987	0.1571	0.09
66	Journal	1	Roe & Flint	2007	14	14	4	0.13	8	⋯	1.357	0.36267	0.1333	0.3651	0.3038	0.30
67	Journal	1	Simmonds-Moore & Holt	2007	26	26	6	0.25	4	⋯	-0.390	-0.07649	0.0364	0.1908	-0.1068	0.16
68	Proceedings	2	Smith & Savva	2008	114	114	39	0.25	4	⋯	2.160	0.20230	0.0105	0.1026	0.1957	0.09
69	Proceedings	2	Parker & Sj<f6>d<e9>n - prime	2008	29	29	4	0.25	4	⋯	-1.180	-0.21912	0.0219	0.1479	-0.2461	0.12

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
69	Proceedings	2	Parker & Sj<f6>d<e9>n - no prime	2008	29	29	8	0.25	4	⋯	0.110	0.02043	0.0367	0.1917	-0.0066	0.16
70	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - pictures	2009	30	30	5	0.25	4	⋯	-0.840	-0.15336	0.0247	0.1571	-0.1794	0.13
70	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - objects	2009	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18
71	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - b	2009	90	90	30	0.25	4	⋯	1.700	0.17920	0.0132	0.1148	0.1707	0.10
72	Journal	1	Parker	2010	14	28	10	0.25	4	⋯	1.090	0.29131	0.0875	0.2957	0.2325	0.23
73	Journal	1	Marcusson-Clavertz & Carde<f1>a	2011	26	26	7	0.25	4	⋯	0.039	0.00765	0.0404	0.2009	-0.0227	0.17
74	Journal	1	P<e9>rez-Navarro & Guerra	2012	50	50	15	0.25	4	⋯	0.650	0.09192	0.0224	0.1497	0.0765	0.13
75	Journal	1	P<e9>rez-Navarro & Cox - exp1	2012	60	60	20	0.25	4	⋯	1.340	0.17299	0.0198	0.1405	0.1602	0.12
75	Journal	1	P<e9>rez-Navarro & Cox - exp2	2012	90	90	24	0.25	4	⋯	0.240	0.02530	0.0116	0.1076	0.0168	0.09
75	Journal	1	P<e9>rez-Navarro & Cox - exp3	2012	55	55	18	0.25	4	⋯	1.170	0.15776	0.0213	0.1461	0.1438	0.13
76	Journal	1	Roe, Cooper, et al. - expt 1	2010	40	40	14	0.25	4	⋯	1.280	0.20239	0.0303	0.1742	0.1830	0.15
76	Journal	1	Roe, Cooper, et al. - expt 2	2014	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
76	Journal	1	Roe, Cooper, et al. - expt 3	2012	40	40	16	0.25	4	⋯	2.010	0.31781	0.0320	0.1789	0.2985	0.15
77	Journal	1	Watt, Dawson, Tullo, Pooley & Rice	2020	60	60	22	0.25	4	⋯	1.940	0.25045	0.0206	0.1437	0.2377	0.13
78	Journal	1	Carde<f1>a & Marcusson-Clavertz	2020	35	35	8	0.25	4	⋯	-0.100	-0.01690	0.0269	0.1639	-0.0391	0.14

In [3]:
```
install.packages("metafor")
```

```
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

In [4]:
```
library(metafor)
```

```
Le chargement a nécessité le package : Matrix

Warning message:
“le package ‘Matrix’ a été compilé avec la version R 4.2.3”
Le chargement a nécessité le package : metadat

Le chargement a nécessité le package : numDeriv


Loading the 'metafor' package (version 4.2-0). For an
introduction to the package please type: help(metafor)
```

Overall frequentist random-effect model for effect size Hedges' g

In [7]:
```
yi=data$ESg
vi=data$SEg^2


# Overall effect


res= rma(yi,vi, method="REML", data = data, #subset=(participantsSel==0),
         knha=TRUE, slab=paste0(data$Study))

summary.rma(res)
```

```
Random-Effects Model (k = 113; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
 -9.4481   18.8962   22.8962   28.3332   23.0063

tau^2 (estimated amount of total heterogeneity): 0.0435 (SE = 0.0089)
tau (square root of estimated tau^2 value):      0.2085
I^2 (total heterogeneity / total variability):   68.71%
H^2 (total variability / sampling variability):  3.20

Test for Heterogeneity:
Q(df = 112) = 416.7667, p-val < .0001

Model Results:

estimate      se    tval   df    pval   ci.lb   ci.ub
  0.0996  0.0244  4.0778  112  <.0001  0.0512  0.1481  ***

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Weighted median Hartwig, F. P., Davey Smith, G., Schmidt, A. F., Sterne, J. A., Higgins, J. P., & Bowden, J.

(2020).

The median and the mode as robust meta-analysis estimators in the presence of small-study effects and outliers. Research Synthesis Methods. [https://doi.org/10.1002/jrsm.1402 (https://doi.org/10.1002/jrsm.1402)](https://doi.org/10.1002/jrsm.1402)

beta.in: point estimates (mean differences, log-odds ratio, etc.).

se.in: standard errors

alpha: confidence level of the confidence intervals. Defaults to 0.05 (i.e., 95% confidence intervals)

In [8]:
```
#beta.in<-data$ESpid
# i replaced data$ESpid with data$ESg since the variable ESpid doesn't exist in data
beta.in<-data$ESg


#se.in<-sqrt(data$Varpi)
# i replaced sqrt(data$Varpi) with data$Seg since the variable Varpi doesn't exist in data
# and sqrt(Var) is SD, and SE = SD / sqrt(n)
se.in<-data$SEg


WeightedMedianMeta <- function(beta.in, se.in, alpha=0.05,n_boot=1e4) {

        #Function to calculate the point estimate
        weighted.median <- function(beta.in, weights.in) {
                beta.order          <- beta.in[order(beta.in)]
                weights.order       <- weights.in[order(beta.in)]
                weights.sum         <- cumsum(weights.order)-0.5*weights.order
                weights.sum         <- weights.sum/sum(weights.order)
                below               <- max(which(weights.sum<0.5))
                weighted.median.est <- beta.order[below] + (beta.order[below+1]-beta.order[below])*
                        (0.5-weights.sum[below])/(weights.sum[below+1]-weights.sum[below])
                return(weighted.median.est)
        }

        #Calculate point estimate
        weights     <- se.in^-2                          #Inverse-variance weights
        combined.beta <- weighted.median(beta.in, weights) #Inverse-variance weighted median

        #Calculate standard errors through bootstrapping
        boot.dist <- numeric(n_boot)
        for(a in 1:n_boot) {
                beta.boot    <- rnorm(n=length(beta.in), mean=beta.in, sd=se.in)
                boot.dist[a] <- weighted.median(beta.boot, weights)
        }
        combined.se <- mad(boot.dist)

        #Calculate confidence intervals
        ci <- combined.beta+c(-1,1)*qnorm(1-alpha/2)*combined.se

        #Calculate P-value
        P <- pnorm(abs(combined.beta)/combined.se, lower.tail=F)*2

        #Provide results
```

```
        results        <- c(combined.beta, combined.se, ci, P)
        names(results) <- c('Beta', 'SE', 'CIlow', 'CIupp', 'Pvalue')
        return(results)
}

WeightedMedianMeta (beta.in, se.in, alpha=0.05,n_boot=1e4)
```

Beta
0.0171769399028546
SE
0.0225184057101839
CIlow
-0.0269583242783671
CIupp
0.0613122040840762
Pvalue
0.445585329230175

The values in R Studio from the original xlsx file (instead of csv file with 4 decimal rounding) are :

Beta	SE	CIlow	CIupp	Pvalue
0.01722213	0.02251167	-0.0268999	0.06134419	0.44425303

Cumulative meta-analysis

In [16]:
```
cum <- cumul(res, order = order(data$Year))
```

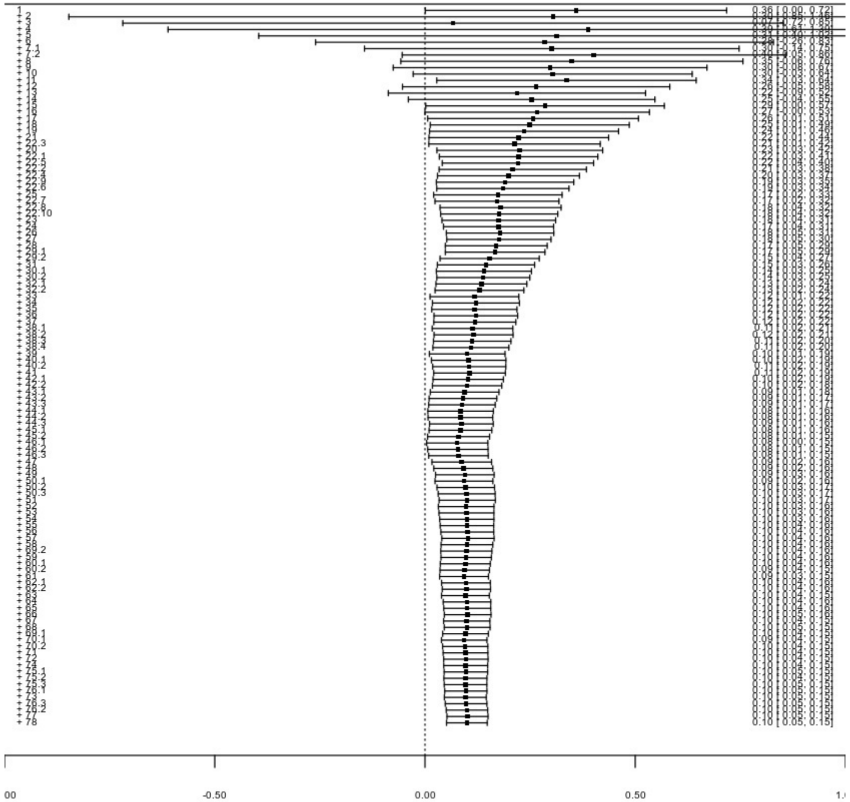
```
Warning message:
“Use of order() in 'order' argument is probably erroneous.”
```

In [17]:
```
cum
```

```
       estimate     se   tval  pvals   ci.lb  ci.ub        Q     Qp   tau2
1        0.3591 0.1828 1.9644 0.0495  0.0008 0.7174   0.0000 1.0000 0.0000
2        0.3044 0.0906 3.3593 0.1842 -0.8470 1.4557   0.3353 0.5626 0.0000
3        0.0667 0.1825 0.3652 0.7499 -0.7187 0.8520   7.6560 0.0218 0.0802
4        0.3878 0.3139 1.2354 0.3046 -0.6112 1.3867  69.3937 0.0000 0.3763
5        0.3127 0.2550 1.2260 0.2875 -0.3954 1.0208  73.4133 0.0000 0.3076
6        0.2842 0.2118 1.3419 0.2373 -0.2602 0.8286  74.1810 0.0000 0.2514
7.1      0.3016 0.1821 1.6564 0.1487 -0.1439 0.7470  74.3481 0.0000 0.2138
7.2      0.4017 0.1928 2.0836 0.0757 -0.0542 0.8576  82.9672 0.0000 0.2586
8        0.3493 0.1764 1.9801 0.0830 -0.0575 0.7561  88.2857 0.0000 0.2416
9        0.2975 0.1649 1.8040 0.1047 -0.0756 0.6706  94.7301 0.0000 0.2334
10       0.3037 0.1489 2.0397 0.0687 -0.0281 0.6355  95.3788 0.0000 0.2063
11       0.3365 0.1402 2.4007 0.0352  0.0280 0.6450  99.6728 0.0000 0.1989
12       0.2644 0.1459 1.8120 0.0951 -0.0535 0.5822 204.3909 0.0000 0.2448
13       0.2187 0.1416 1.5446 0.1464 -0.0872 0.5247 209.9329 0.0000 0.2487
14       0.2536 0.1367 1.8555 0.0847 -0.0395 0.5468 224.6386 0.0000 0.2489
15       0.2855 0.1331 2.1451 0.0487  0.0018 0.5692 233.5230 0.0000 0.2504
16       0.2669 0.1259 2.1197 0.0500 -0.0000 0.5338 233.6153 0.0000 0.2360
```

Cumulative meta-analysis

In [18]:
```
par(mar=c(2,2,1,1))
forest(cum, xlim=c(-1,1), #at=log(c(0.125, 0.25, 0.5, 1,2)),
       digits=c(2,2), cex=0.5)
```



Moderators analyses

year trend

In [19]:
```
resYear= rma(yi,vi, method= "REML", mods = ~ data$Year, data=data, knha=TRUE, slab=paste0(data$Study))

summary.rma(resYear)

#add the following syntax to the overall analysis; line 23
```

```
Mixed-Effects Model (k = 113; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
 -9.7018   19.4035   25.4035   33.5321   25.6278

tau^2 (estimated amount of residual heterogeneity):     0.0444 (SE = 0.0091)
tau (square root of estimated tau^2 value):             0.2106
I^2 (residual heterogeneity / unaccounted variability): 69.01%
H^2 (unaccounted variability / sampling variability):   3.23
R^2 (amount of heterogeneity accounted for):            0.00%

Test for Residual Heterogeneity:
QE(df = 111) = 406.6253, p-val < .0001

Test of Moderators (coefficient 2):
F(df1 = 1, df2 = 111) = 0.3181, p-val = 0.5739

Model Results:

           estimate      se     tval   df    pval    ci.lb    ci.ub
intrcpt      2.5813  4.3998   0.5867  111  0.5586  -6.1372  11.2998
data$Year   -0.0012  0.0022  -0.5640  111  0.5739  -0.0056   0.0031

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

selected participants: subset=(participantsSel==1)

In [20]:

```
# Overall effect for selected participants

res_Sel= rma(yi,vi, method="REML", data = data, subset=(data$participantsSel==1),
         knha=TRUE, slab=paste0(data$Study))

summary.rma(res_Sel)
```

```
Random-Effects Model (k = 43; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
-10.7499   21.4998   25.4998   28.9751   25.8075

tau^2 (estimated amount of total heterogeneity): 0.0696 (SE = 0.0205)
tau (square root of estimated tau^2 value):      0.2639
I^2 (total heterogeneity / total variability):   76.53%
H^2 (total variability / sampling variability):  4.26

Test for Heterogeneity:
Q(df = 42) = 193.7635, p-val < .0001

Model Results:

estimate      se    tval  df    pval   ci.lb   ci.ub
  0.1763  0.0474  3.7176  42  0.0006  0.0806  0.2720  ***

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

non selected participant: subset=(participantsSel==0)

In [21]:
```
# Overall effect for non selected participants

res_nonSel= rma(yi,vi, method="REML", data = data, subset=(data$participantsSel==0),
         knha=TRUE, slab=paste0(data$Study))

summary.rma(res_nonSel)
```

```
Random-Effects Model (k = 70; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
  6.9207  -13.8414   -9.8414   -5.3732   -9.6596

tau^2 (estimated amount of total heterogeneity): 0.0243 (SE = 0.0078)
tau (square root of estimated tau^2 value):      0.1560
I^2 (total heterogeneity / total variability):   56.07%
H^2 (total variability / sampling variability):  2.28

Test for Heterogeneity:
Q(df = 69) = 191.0941, p-val < .0001

Model Results:

estimate      se    tval  df    pval    ci.lb   ci.ub
  0.0462  0.0254  1.8173  69  0.0735  -0.0045  0.0968  .

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

TaskType

In [22]:
```
#Type of task #Type 1: subset(TaskType==1) #Type 2: subset(TaskType==2) #Type 3: subset(TaskType==3)
#Peer-review level #subset(PeerRev==0) #subset(PeerRev==1)
resTaskType <- rma(yi, vi, mods = ~ factor(data$Task)-1, data=data)
resTaskType
anova(resTaskType, L=rbind(c(-1,1,0), c(-1,0,1), c(0,-1,1)))
```

```
Mixed-Effects Model (k = 113; tau^2 estimator: REML)

tau^2 (estimated amount of residual heterogeneity):     0.0441 (SE = 0.0091)
tau (square root of estimated tau^2 value):             0.2101
I^2 (residual heterogeneity / unaccounted variability): 68.86%
H^2 (unaccounted variability / sampling variability):   3.21

Test for Residual Heterogeneity:
QE(df = 110) = 416.2932, p-val < .0001

Test of Moderators (coefficients 1:3):
QM(df = 3) = 17.9664, p-val = 0.0004

Model Results:

                          estimate      se    zval    pval    ci.lb   ci.ub
factor(data$Task)Clair      0.0462  0.0486  0.9501  0.3421  -0.0491  0.1414
factor(data$Task)Precogn    0.1301  0.1140  1.1416  0.2536  -0.0933  0.3535
factor(data$Task)Telep      0.1177  0.0297  3.9700  <.0001   0.0596  0.1759

factor(data$Task)Clair
factor(data$Task)Precogn
factor(data$Task)Telep    ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
Hypotheses:
1: -factor(data$Task)Clair + factor(data$Task)Precogn = 0
2:   -factor(data$Task)Clair + factor(data$Task)Telep = 0
3: -factor(data$Task)Precogn + factor(data$Task)Telep = 0

Results:
   estimate     se    zval   pval
1:   0.0839 0.1239  0.6774 0.4981
2:   0.0716 0.0569  1.2569 0.2088
3:  -0.0124 0.1178 -0.1051 0.9163
```

Peer Review

In [23]:
```
#Type of task #Type 1: subset(TaskType==1) #Type 2: subset(TaskType==2) #Type 3: subset(TaskType==3)
#Peer-review level #subset(PeerRev==0) #subset(PeerRev==1)
resPeerReview <- rma(yi, vi, mods = ~ factor(data$PeerRev)-1, data=data)
resPeerReview
anova(resPeerReview)
```

```
Mixed-Effects Model (k = 113; tau^2 estimator: REML)

tau^2 (estimated amount of residual heterogeneity):     0.0441 (SE = 0.0091)
tau (square root of estimated tau^2 value):             0.2101
I^2 (residual heterogeneity / unaccounted variability): 68.95%
H^2 (unaccounted variability / sampling variability):   3.22

Test for Residual Heterogeneity:
QE(df = 111) = 414.5824, p-val < .0001

Test of Moderators (coefficients 1:2):
QM(df = 2) = 16.3650, p-val = 0.0003

Model Results:

                       estimate      se    zval    pval   ci.lb   ci.ub
factor(data$PeerRev)1    0.0933  0.0377  2.4767  0.0133  0.0195  0.1671   *
factor(data$PeerRev)2    0.1048  0.0328  3.1986  0.0014  0.0406  0.1690  **

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1


Test of Moderators (coefficients 1:2):
QM(df = 2) = 16.3650, p-val = 0.0003
```

Statistical Power analysis

We need first to install the metameta package

In [24]:
```
install.packages('metameta')
```

```
Warning message:
“le package ‘metameta’ n'est pas disponible for this version of R

Une version de ce package pour votre version de R est peut-être disponible ailleurs,
Voyez des idées à
https://cran.r-project.org/doc/manuals/r-patched/R-admin.html#Installing-packages” (https://cran.r-project.org/doc/manuals/r-pa
tched/R-admin.html#Installing-packages”)
```

It does not work with install.packages()

> One needs to follow the instructions on page 4 of DOI: 10.1177/25152459221147260

In [25]:
```
# see install explanations at https://www.youtube.com/watch?v=KA8tCHcO538
install.packages('devtools')
library(devtools)
```

```
installation des dépendances ‘credentials’, ‘gitcreds’, ‘httr2’, ‘ini’, ‘systemfonts’, ‘textshaping’, ‘diffobj’, ‘gert’, ‘gh’,
‘rprojroot’, ‘whisker’, ‘downlit’, ‘ragg’, ‘xopen’, ‘brew’, ‘brio’, ‘praise’, ‘processx’, ‘waldo’, ‘usethis’, ‘desc’, ‘miniUI’,
‘pkgbuild’, ‘pkgdown’, ‘pkgload’, ‘profvis’, ‘rcmdcheck’, ‘remotes’, ‘roxygen2’, ‘rversions’, ‘sessioninfo’, ‘testthat’, ‘urlch
ecker’


Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé

Le chargement a nécessité le package : usethis
```

In [26]:
```
devtools::install_github("dsquintana/metameta")
```

```
Downloading GitHub repo dsquintana/metameta@HEAD


viridisLite (0.4.1 -> 0.4.2) [CRAN]
vctrs       (0.6.2 -> 0.6.3) [CRAN]
cpp11       (0.4.3 -> 0.4.4) [CRAN]
ggthemes    (NA    -> 4.2.4) [CRAN]

Installing 4 packages: viridisLite, vctrs, cpp11, ggthemes

Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé


── R CMD build ─────────────────────────────────────────────────────────────────
* checking for file ‘/tmp/RtmpNYgmbF/remotes13b35c92591/dsquintana-metameta-3d4d701/DESCRIPTION’ ... OK
* preparing ‘metameta’:
* checking DESCRIPTION meta-information ... OK
* checking for LF line-endings in source and make files and shell scripts
* checking for empty or unneeded directories
* building ‘metameta_0.2.tar.gz’
```

In [27]:
```r
library (metameta)

# metameta needs a "sei" column in the dataset instead of "SEg"
data$yi=data$ESg
data$sei <- data$SEg


# power_ma <- mapower_se(dat = data, observed_es = 0.178, name = "GZ 1974-2020")
# The "observed_es" argument is the observed summary effect size of the meta-analysis.
# This value "0.178" is the one used in Quintana 2023, but not the one of Tressoldi & Storm !!
# I replaced it with 0.1

power_ma <- mapower_se(dat = data, observed_es = 0.1, name = "GZ 1974-2020")


options(max.print=1000000)

power_ma
```

```
$dat
    Study Type.of.Publication Publication.rank
1       1             Journal                1
2       2             Journal                1
3       3       RIP - Article                3
4       4       RIP - Article                3
5       5       RIP - Article                3
6       6             Journal                1
7       7             Journal                1
8       7             Journal                1
9       8             Journal                1
10      9             Journal                1
11     10       RIP - Article                3
12     11             Journal                1
13     12             Journal                1
14     13             Journal                1
15     14             Journal                1
16     15             Journal                1
17     16       RIP - Article                3
18     17       RIP - Article                3
```

es01 gives the statistical power assuming that 0.1 is the “true” effect size, es02 gives the statistical power assuming that 0.2 is the “true” effect size, and so forth.

In [28]:
```
power_ma$power_median_dat
```

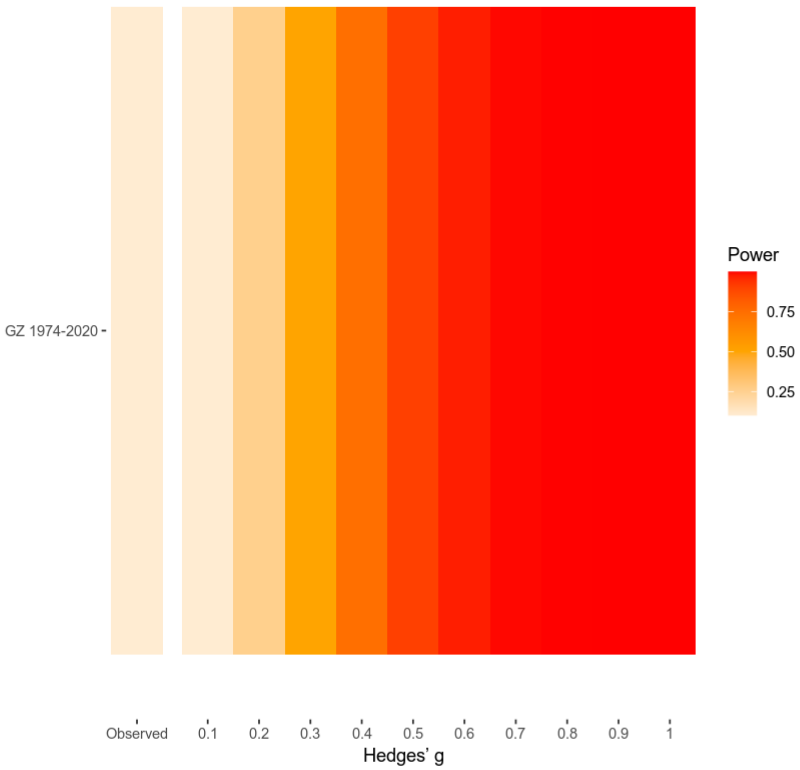
A data.frame: 1 × 13

power_es_observed	es01	es02	es03	es04	es05	es06	es07	es08	es09	es1	es_observed	meta_analysis_
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	
0	0.1005982	0.2591462	0.5034497	0.7468836	0.9067287	0.9759817	0.9957709	0.999498	0.9999602	0.9999979	0.1005982	GZ 197

Firepower plot, which visualizes the median statistical power for a range of hypothetical effect sizes across all studies included in a meta-analysis. The statistical power for the observed summary effect size of the meta-analysis is also shown

In [34]:
```
firepower(list(power_ma$power_median_dat), es = "Hedges’ g")
```

```
$fp_plot

$dat
  es_observed      es01      es02      es03      es04      es05      es06
1   0.1005982 0.1005982 0.2591462 0.5034497 0.7468836 0.9067287 0.9759817
       es07     es08      es09       es1 meta_analysis_name
1 0.9957709 0.999498 0.9999602 0.9999979       GZ 1974-2020

attr(,"class")
[1] "firepower"
```

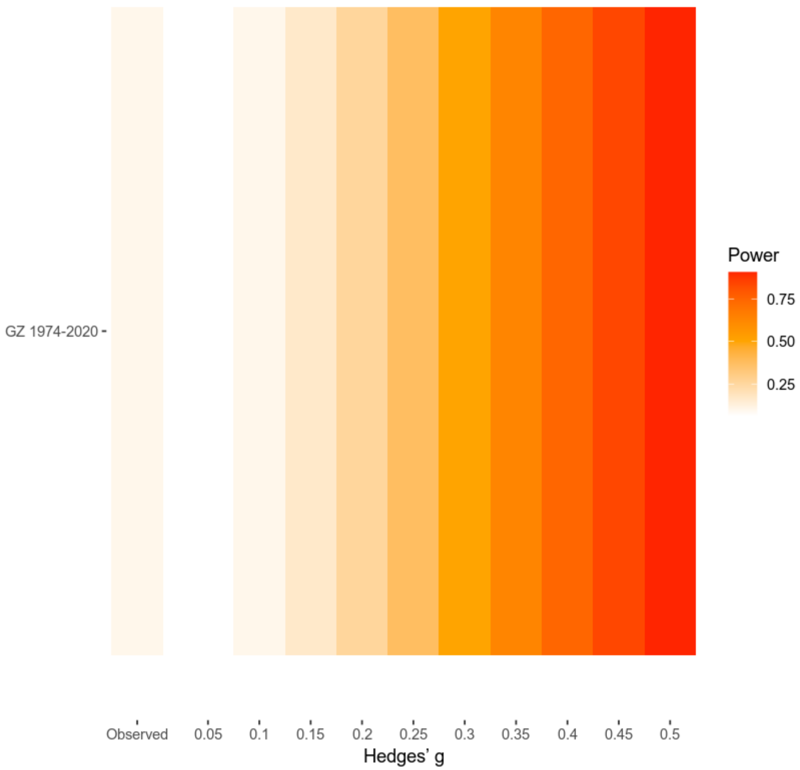


In [35]:
```r
power_GZ19742020_small <- mapower_se(dat = data, size = "small", observed_es = 0.10, name = "GZ 1974-2020")

options(max.print=1000000)

power_GZ19742020_small
```

```
$dat
    Study Type.of.Publication Publication.rank
1       1             Journal                1
2       2             Journal                1
3       3       RIP - Article                3
4       4       RIP - Article                3
5       5       RIP - Article                3
6       6             Journal                1
7       7             Journal                1
8       7             Journal                1
9       8             Journal                1
10      9             Journal                1
11     10       RIP - Article                3
12     11             Journal                1
13     12             Journal                1
14     13             Journal                1
15     14             Journal                1
16     15             Journal                1
17     16       RIP - Article                3
```

In [36]:
```
firepower(list(power_GZ19742020_small$power_median_dat), size = "small", es = "Hedges’ g")
```

```
$fp_plot

$dat
  es_observed      es005      es01     es015      es02     es025      es03
1   0.1005982 0.06241975 0.1005982 0.1662225 0.2591462 0.3748159 0.5034497
      es035      es04     es045      es05 meta_analysis_name
1 0.6318102 0.7468836 0.8395948 0.9067287       GZ 1974-2020

attr(,"class")
[1] "firepower"
```



Compute a bias-corrected effect size with puniform

Publication Bias tests

p-uniform, from Correcting for Publication Bias in a Meta-Analysis with the P-Uniform* Method Robbie C. M. van Aert1 and Marcel A. L. M. van Assen [https://osf.io/ebq6m/ (https://osf.io/ebq6m/)](https://osf.io/ebq6m/)

In [5]:
```
install.packages("puniform")
```

```
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

In [6]:
```
library(puniform)
```

```
Loading 'puniform' package (Version 0.2.6)
```

In [41]:
```
puni_star(yi = data$ES, vi = data$Var, side="right", method="ML", alpha=0.1)
```

```
Error in if (get_LR_tau(prof.tau = 0, yi = yi, vi = vi, est = est, tau.est = tau.est, : valeur manquante là où TRUE / FALSE est
requis
Traceback:

1. puni_star(yi = data$ES, vi = data$Var, side = "right", method = "ML", 
 .     alpha = 0.1)
2. esest_nsig(yi = es$yi, vi = es$vi, ycv = es$zcv * sqrt(es$vi), 
 .     method = method, con = con)
```

There is something wrong due to Child & Levi (1979) "`Var` = 0" value. One needs to filter out this Study from the data in order to use `puniform`

In [2]:
```r
library(dplyr)
data2 <- filter(data, Study!= 12)
data2
```

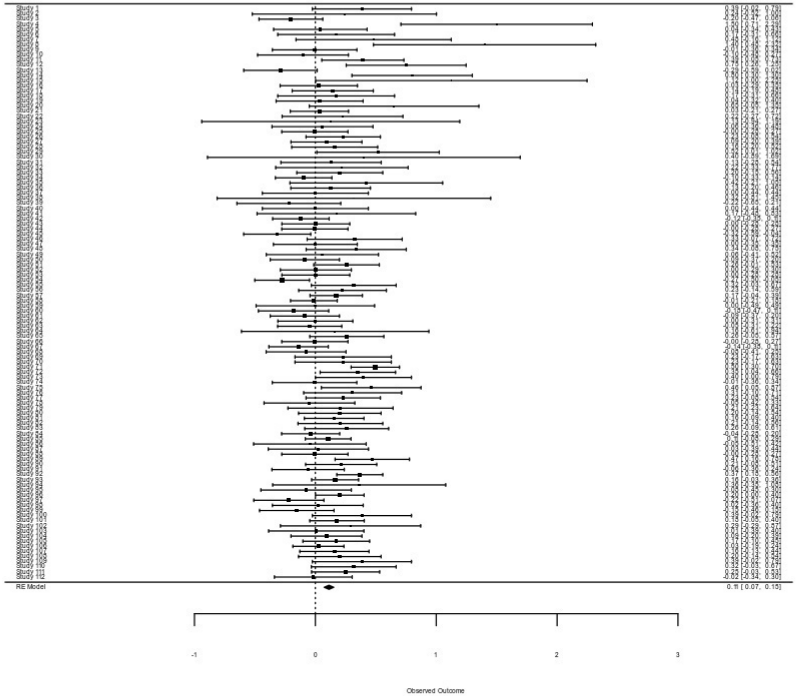
3	RIP - Article	3	Aued	1975	40	40	7	0.25	4	⋯	-1.280	-0.20239	0.0181	0.1347	-0.2217	0
4	RIP - Article	3	Honorton	1976	4	7	6	0.25	4	⋯	3.000	1.50000	0.1633	0.4041	1.2273	0
5	RIP - Article	3	Rogo	1976	28	28	8	0.25	4	⋯	0.220	0.04158	0.0389	0.1972	0.0135	0
6	Journal	1	Rogo, Smith & Terry	1976	20	20	7	0.25	4	⋯	0.770	0.17218	0.0607	0.2463	0.1322	0
7	Journal	1	Terry & Honorton - exp1	1976	12	27	11	0.25	4	⋯	1.670	0.48209	0.1073	0.3276	0.4123	0
7	Journal	1	Terry & Honorton - exp2	1976	6	60	27	0.25	4	⋯	3.430	1.40029	0.2200	0.4690	1.2424	0
8	Journal	1	Palmer, Bogart, Jones & Tart	1977	30	30	7	0.25	4	⋯	-0.031	-0.00566	0.0318	0.1783	-0.0317	0
9	Journal	1	Wood, Kirk & Braud	1977	24	48	10	0.25	4	⋯	-0.500	-0.10206	0.0367	0.1914	-0.1350	0

In [43]:
```r
res2= rma(yi = data2$ES, vi = data2$Var, method="ML", data = data2)

summary.rma(res2)
```

```
Random-Effects Model (k = 112; tau^2 estimator: ML)

  logLik  deviance       AIC       BIC      AICc
  2.9151  164.6152   -1.8301    3.6069   -1.7201

tau^2 (estimated amount of total heterogeneity): 0.0154 (SE = 0.0057)
tau (square root of estimated tau^2 value):      0.1241
I^2 (total heterogeneity / total variability):   36.14%
H^2 (total variability / sampling variability):  1.57

Test for Heterogeneity:
Q(df = 111) = 182.8309, p-val < .0001

Model Results:

estimate      se    zval    pval   ci.lb   ci.ub
  0.1127  0.0204  5.5291  <.0001  0.0728  0.1527  ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Forest plot without Child & Levi (1979) study

In [44]:
```
forest_plot <- forest(res2)
```



In [45]:
```r
# This computation assumes that one-tailed hypothesis tests were conducted in the primary studies

puni_star(yi = data2$ES, vi = data2$Var, side = "right", method="ML", alpha=0.1)


# The puni_star function assumes that two-tailed hypothesis tests were conducted
# in the primary studies. In case one-tailed hypothesis tests were conducted in the primary studies,
# the submitted alpha argument to the puni_star function has to be multiplied by two.
# For example, if one-tailed hypothesis tests were conducted with an alpha level of .05,
# an alpha of 0.1 has to be submitted to the puni_star function.
```

```
Method: ML (k = 112; ksig = 24)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
    0.1341    0.0746    0.1965   20.3654    <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0185    0.0086    0.0338    22.963    <.001
```

In [46]:
```
puni_star(yi = data2$ES, vi = data2$Var, side = "right", method="ML", alpha=0.05)

#  alpha=0.05 is the default
# puni_star(yi = data2$ES, vi = data2$Var, side = "right", method="ML") will give similar results
```

```
Method: ML (k = 112; ksig = 14)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
    0.1807    0.1165    0.2486   32.4726   <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0284    0.0156    0.0479   41.5603   <.001
```

Using `puniform` on the original dataset after replacing the "`Var` = 0" value with "`Var` = 0.001" for Child & Levi (1979) study

check the content of `Var` for Child & Levi (1979) study

In [4]:
```
data$Var[13]
```

0

change the content of `Var` for Child & Levi (1979) study

In [7]:
```
data$Var[13] = 0.001
```

In [8]:
```
data$Var[13]
```

0.001

In [12]:
```
puni_star(yi = data$ES, vi = data$Var, side = "right", method="ML", alpha=0.1)
```

```
Method: ML (k = 113; ksig = 24)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
    0.1526    0.0755    0.2513   18.1141    <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0311    0.0177    0.0539  210.8508    <.001
```

In [18]:
```
puni_star(yi = data$ES, vi = data$Var, side = "right", method="ML", alpha=0.05)
```

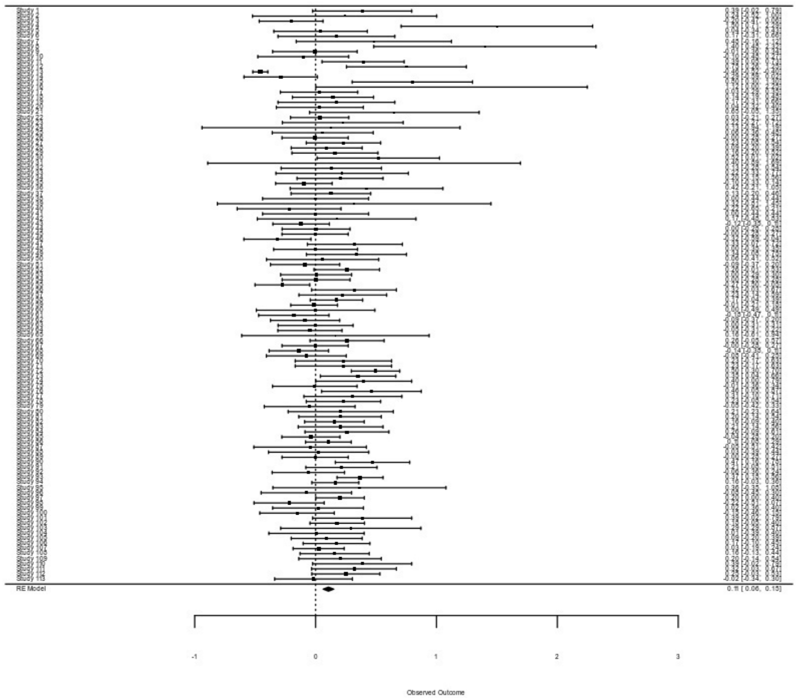
```
Method: ML (k = 113; ksig = 14)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
      0.21    0.1186    0.3429   29.7056    <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0431    0.0236    0.0783  239.6114    <.001
```

In [16]:
```r
res= rma(yi = data$ES, vi = data$Var, method="ML", data = data)

summary.rma(res)
```

```
Random-Effects Model (k = 113; tau^2 estimator: ML)

  logLik  deviance       AIC       BIC      AICc
 -3.4649  182.4450   10.9298   16.3846   11.0389

tau^2 (estimated amount of total heterogeneity): 0.0257 (SE = 0.0072)
tau (square root of estimated tau^2 value):      0.1602
I^2 (total heterogeneity / total variability):   52.88%
H^2 (total variability / sampling variability):  2.12

Test for Heterogeneity:
Q(df = 112) = 436.0928, p-val < .0001

Model Results:

estimate      se    zval    pval   ci.lb   ci.ub
  0.1066  0.0226  4.7116  <.0001  0.0622  0.1509  ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Forest plot with Child & Levi (1979) study

In [17]:
```
forest_plot <- forest(res)
```



Another possibility is that the authors used `puniform` on ESg and SEg^2 instead of ES and Var, respectively

In [8]:
```
puni_star(yi = data$ESg, vi = data$SEg^2, side="right", method="ML", alpha=0.1)
```

```
Method: ML (k = 113; ksig = 26)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
    0.1848    0.0952    0.2957   19.6868    <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0535    0.0346    0.0824  169.3062    <.001
```

The values in R Studio from the original xlsx file (instead of csv file with 4 decimal rounding) are closer to what the authors show in their Table 3 :

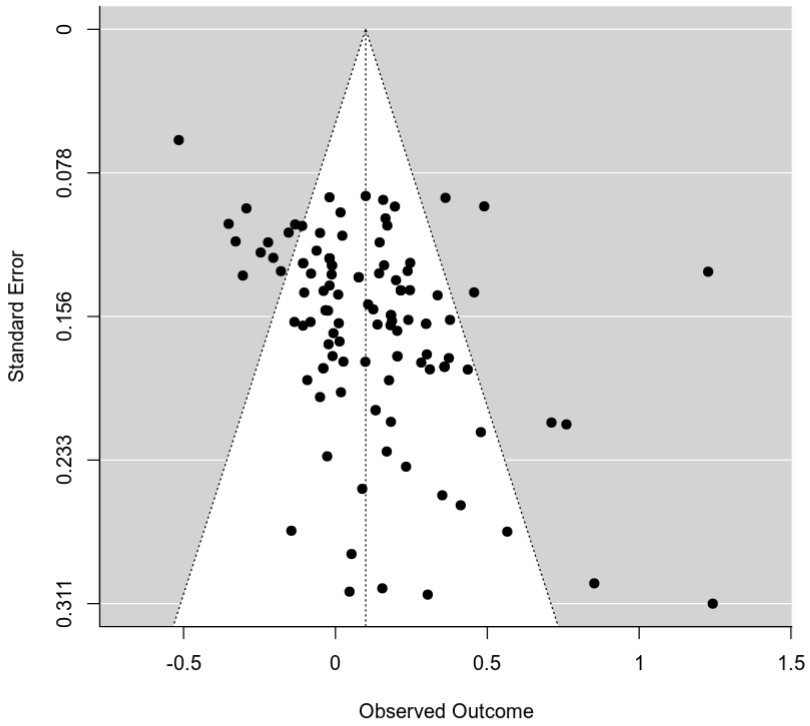
```
> puni_star(yi = data$ESg, vi = data$SEg^2, side="right", method="ML", alpha=0.1)

Method: ML (k = 113; ksig = 26)

Estimating effect size p-uniform*

       est     ci.lb     ci.ub       L.0     pval
    0.1845    0.1034    0.2689   20.8703    <.001

===

Estimating between-study variance p-uniform*

      tau2   tau2.lb   tau2.ub     L.het     pval
    0.0535    0.0372    0.0771  269.1782    <.001
```

Funnel plot for the initial data based on ESg and SEg

In [47]:
```
yi=data$ESg
vi=data$SEg^2


# Overall effect


res= rma(yi,vi, method="REML", data = data, #subset=(participantsSel==0),
         knha=TRUE, slab=paste0(data$Study))

summary.rma(res)
```

```
Random-Effects Model (k = 113; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
 -9.4481   18.8962   22.8962   28.3332   23.0063

tau^2 (estimated amount of total heterogeneity): 0.0435 (SE = 0.0089)
tau (square root of estimated tau^2 value):      0.2085
I^2 (total heterogeneity / total variability):   68.71%
H^2 (total variability / sampling variability):  3.20

Test for Heterogeneity:
Q(df = 112) = 416.7667, p-val < .0001

Model Results:

estimate      se    tval   df    pval   ci.lb   ci.ub
  0.0996  0.0244  4.0778  112  <.0001  0.0512  0.1481  ***

---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

In [48]:
```
funnel_plot <- funnel(res)
```



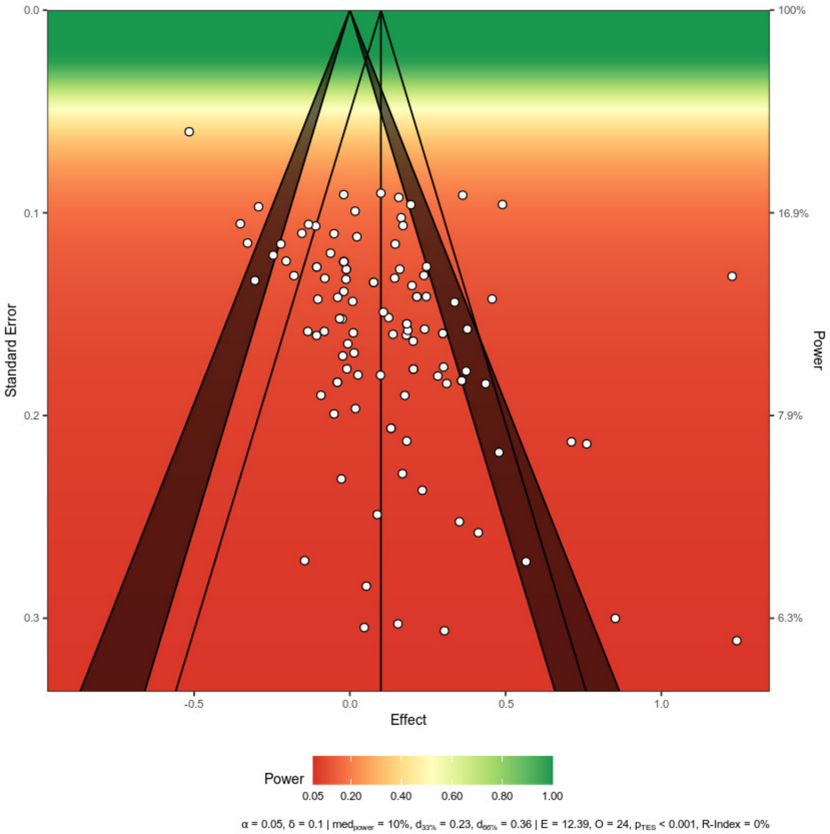
Use the `viz_sunset` function from the `metaviz` R package. This function creates a sunset funnel plot, which is funnel plot variant that visualises the statistial power of each test included in the meta-analysis. [https://www.dsquintana.blog/meta-analysis-power-plot/ (https://www.dsquintana.blog/meta-analysis-power-plot/)](https://www.dsquintana.blog/meta-analysis-power-plot/)

In [37]:
```
install.packages("metaviz")
```

```
installation des dépendances ‘modeltools’, ‘DEoptimR’, ‘BH’, ‘mclust’, ‘flexmix’, ‘prabclus’, ‘diptest’, ‘robustbase’, ‘kernla
b’, ‘anytime’, ‘fracdiff’, ‘lmtest’, ‘tseries’, ‘urca’, ‘corrplot’, ‘moments’, ‘fpc’, ‘tsibble’, ‘forecast’, ‘viridis’, ‘ggsc
i’, ‘ggsignif’, ‘polynom’, ‘rstatix’, ‘nullabor’, ‘gridExtra’, ‘ggpubr’


Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

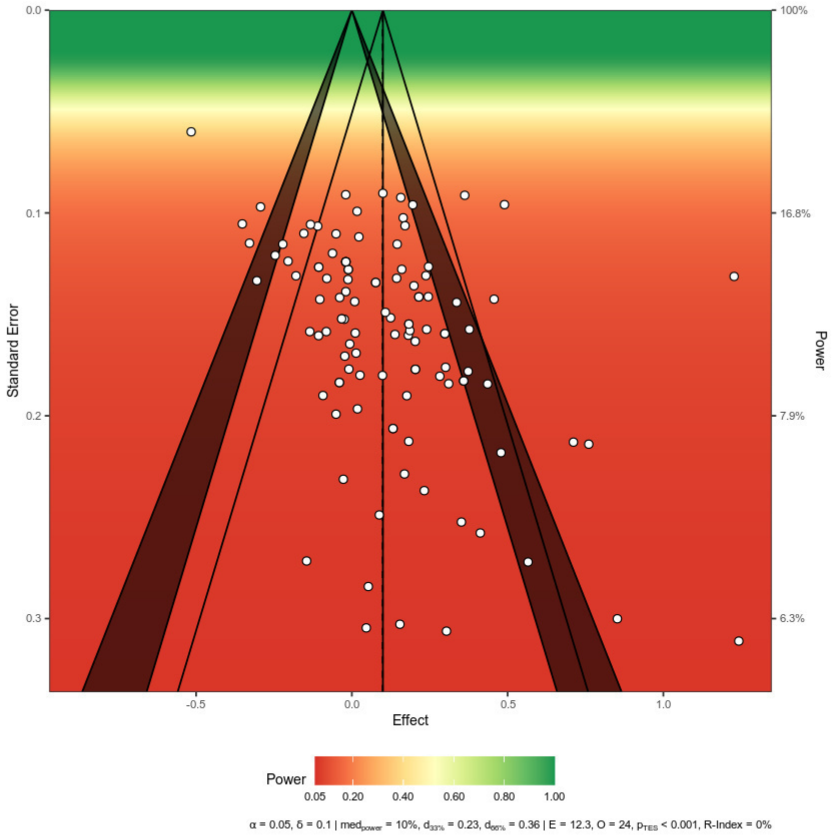
In [38]:
```
library(metaviz)
```

In [49]:
```
viz_sunset(res, contours = TRUE, power_contours = "continuous")
```



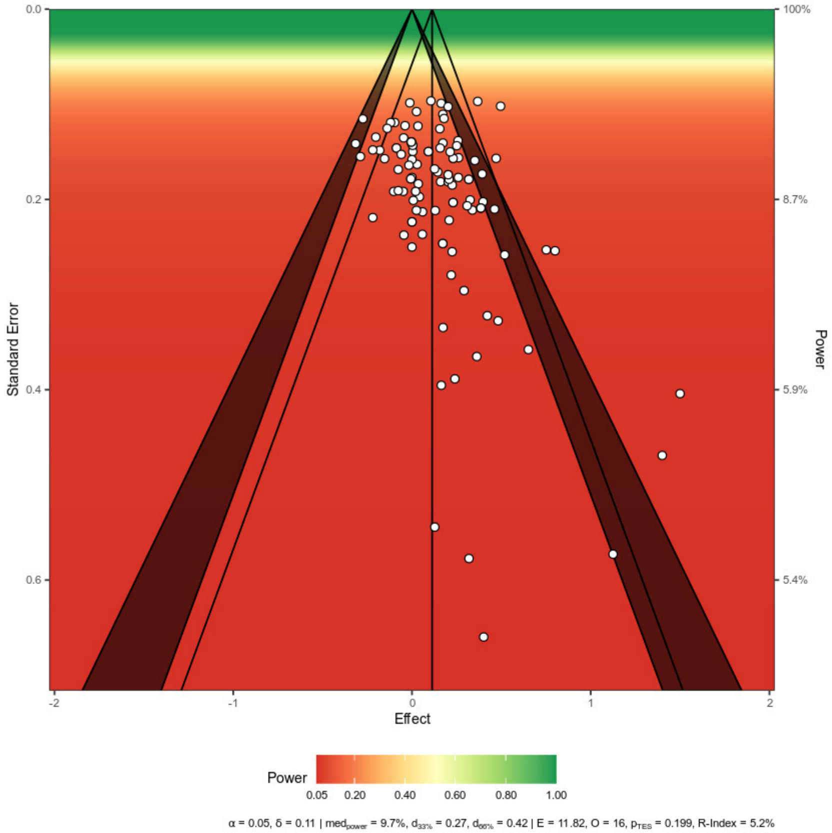
- When including Child & Levi (1979) study, the R-Index (Replicability-index) suggests that all these studies have a null probablility of replicating for the observed effect size δ = 0.0996 https://replicationindex.com/2016/01/31/a-revised-introduction-to-the-r-index/?ref=dsquintana.blog (https://replicationindex.com/2016/01/31/a-revised-introduction-to-the-r-index/?ref=dsquintana.blog)

In [57]:
```
viz_sunset(res, true_effect = 0.099, contours = TRUE, power_contours = "continuous")
```



Sunset Funnel plot for all the data without Child & Levi (1979)

In [50]:
```
viz_sunset(res2, contours = TRUE, power_contours = "continuous")
```



- When excluding Child & Levi (1979) study, the R-Index (Replicability-index) suggests that all these studies have a 5.2% chance of replicating for the observed effect size δ = 0.1127 https://replicationindex.com/2016/01/31/a-revised-introduction-to-the-r-index/?ref=dsquintana.blog (https://replicationindex.com/2016/01/31/a-revised-introduction-to-the-r-index/?ref=dsquintana.blog)

Adding a column in the dataframe that specifies power for each study according to what we think the true effect size is. See Quintana tutorial : [https://www.youtube.com/watch?v=3AYIv4pni00 (https://www.youtube.com/watch?v=3AYIv4pni00)](https://www.youtube.com/watch?v=3AYIv4pni00)

In [51]:
```
s_power <- function(se, true_effect, sig_level)
{
(1 - stats::pnorm(stats::qnorm(1 - sig_level/2) *
                  se, abs(true_effect), se)) +
    stats::pnorm(stats::qnorm(sig_level/2) *
                 se, abs(true_effect), se)
}
```

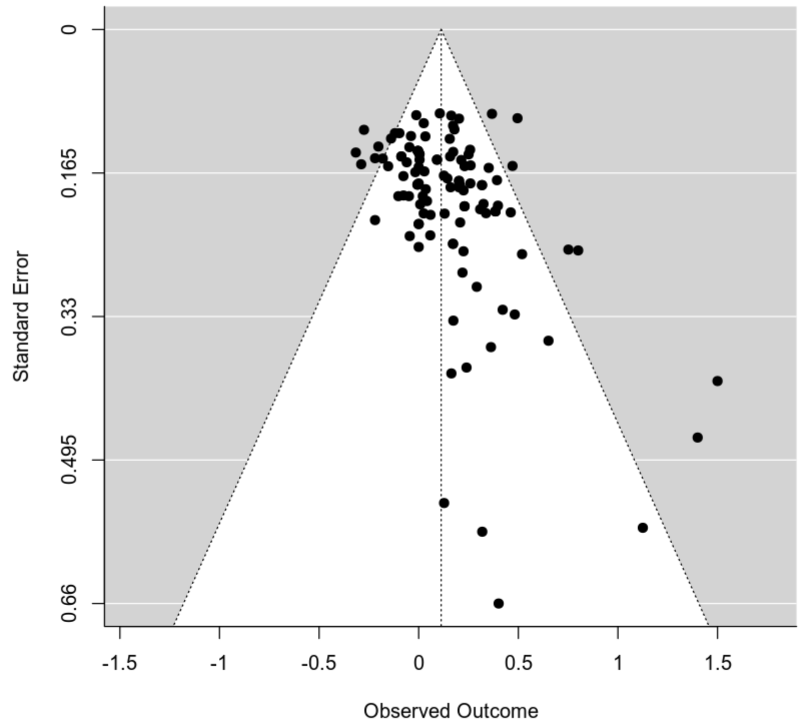
In [52]:
```
# Let's consider that true ES is 0.1

data$power <- s_power(se = funnel_plot$y,
                      true_effect = 0.1,
                      sig_level = 0.05)
```

In [53]:
```
data
```

A data.frame: 113 × 25

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	SE	ESg	SEg	participantsSel	Pe
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<int>	
1	Journal	1	Honorton & Harper	1974	30	30	13	0.25	4	⋯	0.2089	0.3591	0.1828	0	
2	Journal	1	Braud, Wood & Braud	1975	10	10	3	0.17	6	⋯	0.3885	0.1543	0.3028	0	
3	RIP - Article	3	Palmer & Aued	1975	40	40	7	0.25	4	⋯	0.1347	-0.2217	0.1154	0	
4	RIP - Article	3	Honorton	1976	4	7	6	0.25	4	⋯	0.4041	1.2273	0.1313	1	
5	RIP - Article	3	Rogo	1976	28	28	8	0.25	4	⋯	0.1972	0.0135	0.1691	0	
6	Journal	1	Rogo, Smith & Terry	1976	20	20	7	0.25	4	⋯	0.2463	0.1322	0.2063	1	

In [58]:
```
funnel_plot2 <- funnel(res2)
```



Mathur, M., & VanderWeele, T. (2019). Sensitivity analysis for publication bias in meta-analyses.[https://osf.io/s9dp6 (https://osf.io/s9dp6)](https://osf.io/s9dp6)

In [59]:
```
install.packages("PublicationBias")
```

```
installation des dépendances ‘rbibutils’, ‘metabias’, ‘Rdpack’, ‘robumeta’


Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

In [60]:
```
library(PublicationBias)
```

η is an unknown ratio by which ‘statistically significant’ results are more likely to be published than negative or ‘non-significant’ results

sensitivity analyses enable statements such as ‘For publication bias to shift the observed point estimate to the null, “significant” results would need to be at least 30 fold more likely to be published than negative or “non-significant” results’ (see [https://doi.org/10.1111/rssc.12440 (https://doi.org/10.1111/rssc.12440)](https://doi.org/10.1111/rssc.12440))

```
In [64]: eta.list = as.list( c( 200, 150, 100, 50, 40, 30, 20, rev( seq(1,15,1) ) ) )
res.list = lapply( eta.list, function(x) {
        cat("\n Working on eta = ", x)
        return( corrected_meta( yi = yi,
                                vi = vi,
                                eta = x,
                                model = "robust",
                                favor.positive = T,
                                small=T
                                ) )
}
)

res.df = as.data.frame( do.call( "rbind", res.list ) )
```

```
 Working on eta =  200
 Working on eta =  150
 Working on eta =  100
 Working on eta =  50
 Working on eta =  40
 Working on eta =  30
 Working on eta =  20
 Working on eta =  15
 Working on eta =  14
 Working on eta =  13
 Working on eta =  12
 Working on eta =  11
 Working on eta =  10
 Working on eta =  9
 Working on eta =  8
 Working on eta =  7
 Working on eta =  6
 Working on eta =  5
 Working on eta =  4
 Working on eta =  3
 Working on eta =  2
 Working on eta =  1
```

In [66]:
```
require(ggplot2)
ggplot( data = res.df, aes( x = eta, y = est ) ) +

        geom_ribbon( data = res.df, aes( x = eta, ymin = lo, ymax = hi ), fill = "gray" ) +

        geom_line( lwd = 1.2 ) +
        xlab( bquote( eta ) ) +
        ylab( bquote( hat(mu)[eta] ) ) +

        theme_classic()
```

```
Le chargement a nécessité le package : ggplot2

Warning message:
“le package ‘ggplot2’ a été compilé avec la version R 4.2.3”
ERROR while rich displaying an object: Error in `geom_ribbon()`:
! Problem while computing aesthetics.
i Error occurred in the 1st layer.
Caused by error in `FUN()`:
! objet 'eta' introuvable

Traceback:
1. tryCatch(withCallingHandlers({
 .     if (!mime %in% names(repr::mime2repr))
 .         stop("No repr_* for mimetype ", mime, " in repr::mime2repr")
 .     rpr <- repr::mime2repr[[mime]](obj)
 .     if (is.null(rpr))
 .         return(NULL)
 .     prepare_content(is.raw(rpr), rpr)
 . }, error = error_handler), error = outer_handler)
```

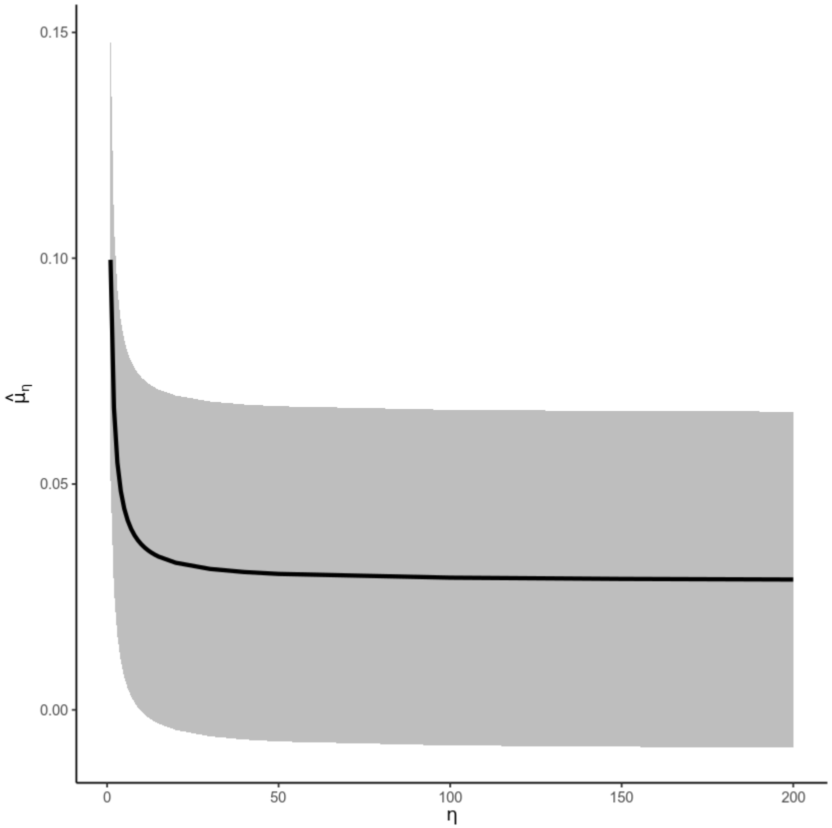
- The above code doesn't work

Let's adapt the code available in Package `PublicationBias` Manual

In [80]:
```
yi=data$ESg
vi=data$SEg^2


# Overall effect


res= rma(yi,vi, method="REML", data = data, #subset=(participantsSel==0),
         knha=TRUE, slab=paste0(data$Study))

summary.rma(res)
```

```
Random-Effects Model (k = 113; tau^2 estimator: REML)

  logLik  deviance       AIC       BIC      AICc
 -9.4481   18.8962   22.8962   28.3332   23.0063

tau^2 (estimated amount of total heterogeneity): 0.0435 (SE = 0.0089)
tau (square root of estimated tau^2 value):      0.2085
I^2 (total heterogeneity / total variability):   68.71%
H^2 (total variability / sampling variability):  3.20

Test for Heterogeneity:
Q(df = 112) = 416.7667, p-val < .0001

Model Results:

estimate      se     tval   df     pval    ci.lb   ci.ub
  0.0996  0.0244   4.0778  112   <.0001   0.0512  0.1481   ***

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

In [81]:
```r
##### Make sensitivity plot as in Mathur & VanderWeele (2020) #####
# range of parameters to try (more dense at the very small ones)
selection_ratios <- c(200, 150, 100, 50, 40, 30, 20, seq(15, 1))

# compute estimate for each value of selection_ratio
estimates <- lapply(selection_ratios, function(e) {
pubbias_meta(yi = yi, vi = vi,
selection_ratio = e, model_type = "robust",
favor_positive = TRUE)$stats
})
estimates <- dplyr::bind_rows(estimates)
estimates$selection_ratio <- selection_ratios


require(ggplot2)
ggplot(estimates, aes(x = selection_ratio, y = estimate)) +
geom_ribbon(aes(ymin = ci_lower, ymax = ci_upper), fill = "gray") +
geom_line(lwd = 1.2) +
labs(x = bquote(eta), y = bquote(hat(mu)[eta])) +
theme_classic()
```


0.15
0.10
0.05
0.00
$\hat{\mu}_\eta$
0
50
100
150
200
η

```
In [82]: estimates
```

A data.frame: 22 × 7

model	estimate	se	ci_lower	ci_upper	p_value	selection_ratio
<chr>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
pubbias	0.02885574	0.01869559	-0.0083255331	0.06603702	1.265014e-01	200
pubbias	0.02899443	0.01869165	-0.0081789911	0.06616786	1.246350e-01	150
pubbias	0.02927157	0.01868401	-0.0078866529	0.06642980	1.209737e-01	100
pubbias	0.03010110	0.01866314	-0.0070155709	0.06721778	1.105455e-01	50
pubbias	0.03051481	0.01865384	-0.0065833435	0.06761296	1.056340e-01	40
pubbias	0.03120276	0.01864002	-0.0058678294	0.06827334	9.787685e-02	30
pubbias	0.03257282	0.01861855	-0.0044548267	0.06960047	8.387766e-02	20
pubbias	0.03393516	0.01860512	-0.0030654497	0.07093577	7.172801e-02	15
pubbias	0.03432299	0.01860273	-0.0026727548	0.07131874	6.856835e-02	14
pubbias	0.03476972	0.01860076	-0.0022219761	0.07176141	6.508409e-02	13
pubbias	0.03528985	0.01859952	-0.0016992006	0.07227889	6.122912e-02	12
pubbias	0.03590310	0.01859950	-0.0010856873	0.07289189	5.695107e-02	11
pubbias	0.03663694	0.01860153	-0.0003555736	0.07362945	5.219206e-02	10
pubbias	0.03753082	0.01860698	0.0005278625	0.07453377	4.689174e-02	9
pubbias	0.03864349	0.01861830	0.0016185715	0.07566840	4.099503e-02	8
pubbias	0.04006648	0.01864002	0.0029991844	0.07713377	3.446987e-02	7
pubbias	0.04195066	0.01868105	0.0048030126	0.07909831	2.734555e-02	6
pubbias	0.04456359	0.01876048	0.0072600369	0.08186714	1.979090e-02	5
pubbias	0.04842942	0.01892400	0.0108044213	0.08605442	1.225974e-02	4
pubbias	0.05473350	0.01929985	0.0163689905	0.09309801	5.690338e-03	3
pubbias	0.06684512	0.02034591	0.0264214659	0.10726878	1.454735e-03	2
pubbias	0.09964273	0.02452292	0.0509769240	0.14830854	9.774728e-05	1

Vevea, J. L. & Woods, C. M. (2005). Publication bias in research synthesis: Sensitivity analysis using a priori weight functions. *Psychological Methods*, 10, 428.

In [84]:
```
install.packages("weightr")
```

```
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

In [85]:
```
install.packages("reshape2")
```

```
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé
```

In [86]:
```r
library(weightr)
library(reshape2)


d.hat<-data$ESg
var.hat<-data$SEg^2

weightfunct(d.hat, var.hat, steps = c(0.025, 1), mods = NULL, weights = NULL, fe = FALSE, table = TRUE)
```

```
Le chargement a nécessité le package : scales


Attachement du package : ‘weightr’


L'objet suivant est masqué depuis ‘package:metafor’:

    funnel


L'objet suivant est masqué depuis ‘package:metadat’:

    dat.bangertdrowns2004


L'objet suivant est masqué depuis ‘package:stats’:

    density



Attachement du package : ‘reshape2’


Les objets suivants sont masqués depuis ‘package:data.table’:

    dcast, melt
```

```
Unadjusted Model (k = 113):

tau^2 (estimated amount of total heterogeneity): 0.0429 (SE = 0.0085)
tau (square root of estimated tau^2 value):  0.2072

Test for Heterogeneity:
Q(df = 112) = 416.7667, p-val = 2.25865e-36

Model Results:

          estimate std.error z-stat      p-val   ci.lb  ci.ub
Intercept  0.09948   0.02462  4.041 5.3255e-05 0.05123 0.1477

Adjusted Model (k = 113):

tau^2 (estimated amount of total heterogeneity): 0.0652 (SE = 0.0157)
tau (square root of estimated tau^2 value):  0.2553

Test for Heterogeneity:
Q(df = 112) = 416.7667, p-val = 2.25865e-36

Model Results:

              estimate std.error z-stat      p-val  ci.lb  ci.ub
Intercept       0.2174   0.05863  3.707 0.00020935 0.1025 0.3323
0.025 < p < 1   3.4786   1.48902  2.336 0.01948238 0.5602 6.3970

Likelihood Ratio Test:
X^2(df = 1) = 8.884952, p-val = 0.0028753

Number of Effect Sizes per Interval:

                     Frequency
p-values <0.025             18
0.025 < p-values < 1        95
```

- The `weightfunct` function allows meta-analysts to estimate both the weight-function model for publication bias that was originally published in Vevea and Hedges (1995) and the modified version presented in Vevea and Woods (2005).

- N.B.: according to van Aert & van Assen 2021 (https://osf.io/jngwk/download (https://osf.io/jngwk/download)) : "A drawback of the approach of Vevea and Woods is that bias in the estimates of the effect size and between-study variance is introduced if the weights are incorrectly specified."

Bartoš F, Maier M RoBMA: An R Package for Robust Bayesian Meta-Analyses. R package version 1.0.4, (2020). https://CRAN.R-project.org/package=RoBMA (https://CRAN.R-project.org/package=RoBMA)

In [87]:
```
install.packages("RoBMA")
```

```
Warning message:
“le package ‘RoBMA’ n'est pas disponible for this version of R

Une version de ce package pour votre version de R est peut-être disponible ailleurs,
Voyez des idées à
https://cran.r-project.org/doc/manuals/r-patched/R-admin.html#Installing-packages” (https://cran.r-project.org/doc/manuals/r-pa
tched/R-admin.html#Installing-packages”)
```

https://cran.r-project.org/web/packages/RoBMA/index.html (https://cran.r-project.org/web/packages/RoBMA/index.html)

Package ‘RoBMA’ was removed from the CRAN repository. Formerly available versions can be obtained from the archive. Archived on 2023-07-11 as issues were not corrected in time. A summary of the most recent check results can be obtained from the check results archive. Please use the canonical form https://CRAN.R-project.org/package=RoBMA (https://CRAN.R-project.org/package=RoBMA) to link to this page.

In [90]:
```
devtools::install_github("FBartos/RoBMA")
```

```
Downloading GitHub repo FBartos/RoBMA@HEAD


rjags   (NA -> 4-14   ) [CRAN]
runjags (NA -> 2.2.2-1) [CRAN]

Installing 2 packages: rjags, runjags

Warning message in i.p(...):
“l'installation du package ‘rjags’ a eu un statut de sortie non nul”
Warning message in i.p(...):
“l'installation du package ‘runjags’ a eu un statut de sortie non nul”
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé


── R CMD build ─────────────────────────────────────────────────────────────────
* checking for file ‘/tmp/RtmpNYgmbF/remotes13b4cc106a9/FBartos-RoBMA-edcf9e7/DESCRIPTION’ ... OK
* preparing ‘RoBMA’:
* checking DESCRIPTION meta-information ... OK
* cleaning src
* running ‘cleanup’
* installing the package to process help pages
      -----------------------------------
ERROR: dependencies ‘runjags’, ‘rjags’ are not available for package ‘RoBMA’
* removing ‘/tmp/RtmpHvtPN1/Rinst108104123cbd9/RoBMA’
      -----------------------------------
ERROR: package installation failed
```

```
Error: Failed to install 'RoBMA' from GitHub:
  ! System command 'R' failed
Traceback:

1. devtools::install_github("FBartos/RoBMA")
2. pkgbuild::with_build_tools({
 .     ellipsis::check_dots_used(action = getOption("devtools.ellipsis_action",
 .         rlang::warn))
 .     {
 .         remotes <- lapply(repo, github_remote, ref = ref, subdir = subdir,
 .             auth_token = auth_token, host = host)
 .         install_remotes(remotes, auth_token = auth_token, host = host,
 .             dependencies = dependencies, upgrade = upgrade, force = force,
 .             quiet = quiet, build = build, build_opts = build_opts,
 .             build_manual = build_manual, build_vignettes = build_vignettes,
 .             repos = repos, type = type, ...)
 .     }
 . }, required = FALSE)
3. install_remotes(remotes, auth_token = auth_token, host = host,
 .     dependencies = dependencies, upgrade = upgrade, force = force,
 .     quiet = quiet, build = build, build_opts = build_opts, build_manual = build_manual,
 .     build_vignettes = build_vignettes, repos = repos, type = type,
 .     ...)
4. tryCatch(res[[i]] <- install_remote(remotes[[i]], ...), error = function(e) {
 .     stop(remote_install_error(remotes[[i]], e))
 . })
5. tryCatchList(expr, classes, parentenv, handlers)
6. tryCatchOne(expr, names, parentenv, handlers[[1L]])
7. value[[3L]](cond)
```

`rjags` and `runjags` packages could not be installed. As a result, `RoBMA` couldn't be installed either !!

Fortunately, `RoBMA` is available in JASP...

APPENDIX 2

Some Z score computation and descriptive stats of the paper "Tressoldi, P. & Storm, L. Anomalous perception in a Ganzfeld condition: A meta-analysis of more than 40 years investigation

In [1]:
```
data <- read.csv("GZMADatabase1974_2020_data.csv", sep=";")
```

In [8]:

```
data
```

A data.frame: 113 × 22

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
1	Journal	1	Honorton & Harper	1974	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18
2	Journal	1	Braud, Wood & Braud	1975	10	10	3	0.17	6	⋯	0.759	0.24002	0.1510	0.3885	0.1543	0.30
3	RIP - Article	3	Palmer & Aued	1975	40	40	7	0.25	4	⋯	-1.280	-0.20239	0.0181	0.1347	-0.2217	0.11
4	RIP - Article	3	Honorton	1976	4	7	6	0.25	4	⋯	3.000	1.50000	0.1633	0.4041	1.2273	0.13
5	RIP - Article	3	Rogo	1976	28	28	8	0.25	4	⋯	0.220	0.04158	0.0389	0.1972	0.0135	0.16
6	Journal	1	Rogo, Smith & Terry	1976	20	20	7	0.25	4	⋯	0.770	0.17218	0.0607	0.2463	0.1322	0.20
7	Journal	1	Terry & Honorton - exp1	1976	12	27	11	0.25	4	⋯	1.670	0.48209	0.1073	0.3276	0.4123	0.25
7	Journal	1	Terry & Honorton - exp2	1976	6	60	27	0.25	4	⋯	3.430	1.40029	0.2200	0.4690	1.2424	0.3
8	Journal	1	Palmer, Bogart, Jones & Tart	1977	30	30	7	0.25	4	⋯	-0.031	-0.00566	0.0318	0.1783	-0.0317	0.15
9	Journal	1	Wood, Kirk & Braud	1977	24	48	10	0.25	4	⋯	-0.500	-0.10206	0.0367	0.1914	-0.1350	0.15
10	RIP - Article	3	York	1977	49	49	19	0.20	5	⋯	2.750	0.39286	0.0300	0.1731	0.3772	0.15
11	Journal	1	Schmitt & Stanford	1978	20	20	12	0.25	4	⋯	3.360	0.75132	0.0640	0.2530	0.7113	0.21
12	Journal	1	Child & Levi	1979	14	14	0	0.20	5	⋯	-1.710	-0.45702	0.0000	0.0000	-0.5158	0.06
13	Journal	1	Palmer, Khamashta & Israelson	1979	20	20	2	0.25	4	⋯	-1.290	-0.28845	0.0240	0.1549	-0.3285	0.11
14	Journal	1	Sondow	1979	20	100	41	0.25	4	⋯	3.580	0.80051	0.0645	0.2540	0.7605	0.21
15	Journal	1	Ashton, Dear, Harley & Sargent	1981	4	32	14	0.25	4	⋯	2.250	1.12500	0.3281	0.5728	0.8523	0.30

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
16	RIP - Article	3	Sargent, Harley, Lane & Radcliffe	1981	40	40	11	0.25	4	⋯	0.180	0.02846	0.0266	0.1630	0.0091	0.14
17	RIP - Article	3	Sondow, Braud & Barker	1981	40	40	13	0.25	4	⋯	0.910	0.14388	0.0293	0.1710	0.1245	0.15
18	Journal	1	Sargent	1982	20	20	7	0.25	4	⋯	0.770	0.17218	0.0607	0.2463	0.1322	0.20
19	RIP - Article	3	Sargent, Bartlett & Moss	1982	32	32	9	0.25	4	⋯	0.200	0.03536	0.0337	0.1836	0.0110	0.15
20	RIP - Article	3	Braud, Ackles & Kyles	1984	10	10	6	0.25	4	⋯	2.060	0.65143	0.1280	0.3578	0.5657	0.27
21	Journal	1	Haraldsson & Gissurarson	1985	70	70	19	0.25	4	⋯	0.280	0.03347	0.0151	0.1227	0.0226	0.11
22	Journal	1	Honorton - exp1	1983	19	22	8	0.25	4	⋯	0.980	0.22483	0.0650	0.2549	0.1826	0.21
22	Journal	1	Honorton - exp2	1984	4	9	3	0.25	4	⋯	0.255	0.12750	0.2963	0.5443	-0.1452	0.27
22	Journal	1	Honorton - exp3	1986	24	35	10	0.25	4	⋯	0.290	0.05920	0.0454	0.2130	0.0262	0.18
22	Journal	1	Honorton - exp101	1984	50	50	12	0.25	4	⋯	-0.028	-0.00390	0.0195	0.1395	-0.0193	0.12
22	Journal	1	Honorton - exp102	1985	50	50	18	0.25	4	⋯	1.630	0.23052	0.0246	0.1568	0.2151	0.14
22	Journal	1	Honorton - exp103	1987	50	50	15	0.25	4	⋯	0.650	0.09192	0.0224	0.1497	0.0765	0.13
22	Journal	1	Honorton - exp104/105a	1986	36	36	12	0.25	4	⋯	0.960	0.16000	0.0329	0.1814	0.1384	0.15
22	Journal	1	Honorton - exp104/105b	1988	20	20	10	0.25	4	⋯	2.320	0.51877	0.0667	0.2582	0.4788	0.21
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋱	⋮	⋮	⋮	⋮	⋮	
57	Proceedings	2	Morris, Summers & Yim	2003	40	40	15	0.25	4	⋯	1.640	0.25931	0.0313	0.1768	0.2400	0.15

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
58	Journal	1	Goulding, Westerlund, Parker & Wackermann	2004	64	128	30	0.25	4	⋯	-0.310	-0.03875	0.0150	0.1223	-0.0507	0.11
59	Journal	1	Lau, Howard, Maxwell, & Venter	2009	120	120	36	0.25	4	⋯	1.160	0.10589	0.0093	0.0966	0.0996	0.09
60	Journal	1	Roe, Sherwood & Holt - no sender	2004	17	17	4	0.25	4	⋯	-0.186	-0.04511	0.0564	0.2376	-0.0927	0.19
60	Journal	1	Roe, Sherwood & Holt - sender	2004	23	23	6	0.25	4	⋯	0.120	0.02502	0.0447	0.2115	-0.0095	0.17
61	Journal	1	Stevens	2004	50	50	12	0.25	4	⋯	-0.027	-0.00382	0.0195	0.1395	-0.0192	0.12
62	Journal	1	Parra & Villanueva - visual	2004	54	54	25	0.25	4	⋯	3.460	0.47085	0.0246	0.1567	0.4566	0.14
62	Journal	1	Parra & Villanueva - auditory	2004	54	54	19	0.25	4	⋯	1.570	0.21365	0.0225	0.1501	0.1994	0.13
63	Journal	1	Sherwood, Roe, Holt & Wilson	2005	38	38	8	0.25	4	⋯	-0.370	-0.06002	0.0233	0.1527	-0.0804	0.13
64	Journal	1	Parra & Villanueva	2006	138	138	57	0.25	4	⋯	4.320	0.36774	0.0094	0.0968	0.3623	0.09
65	Journal	1	Putz, Glasser & Wackermann	2007	120	120	39	0.25	4	⋯	1.790	0.16340	0.0098	0.0987	0.1571	0.09
66	Journal	1	Roe & Flint	2007	14	14	4	0.13	8	⋯	1.357	0.36267	0.1333	0.3651	0.3038	0.30
67	Journal	1	Simmonds-Moore & Holt	2007	26	26	6	0.25	4	⋯	-0.390	-0.07649	0.0364	0.1908	-0.1068	0.16
68	Proceedings	2	Smith & Savva	2008	114	114	39	0.25	4	⋯	2.160	0.20230	0.0105	0.1026	0.1957	0.09
69	Proceedings	2	Parker & Sj<f6>d<e9>n - prime	2008	29	29	4	0.25	4	⋯	-1.180	-0.21912	0.0219	0.1479	-0.2461	0.12

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
69	Proceedings	2	Parker & Sj<f6>d<e9>n - no prime	2008	29	29	8	0.25	4	⋯	0.110	0.02043	0.0367	0.1917	-0.0066	0.16
70	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - pictures	2009	30	30	5	0.25	4	⋯	-0.840	-0.15336	0.0247	0.1571	-0.1794	0.13
70	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - objects	2009	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18
71	Journal	1	P<e9>rez-Navarro, Lawrence & Hume - b	2009	90	90	30	0.25	4	⋯	1.700	0.17920	0.0132	0.1148	0.1707	0.10
72	Journal	1	Parker	2010	14	28	10	0.25	4	⋯	1.090	0.29131	0.0875	0.2957	0.2325	0.23
73	Journal	1	Marcusson-Clavertz & Carde<f1>a	2011	26	26	7	0.25	4	⋯	0.039	0.00765	0.0404	0.2009	-0.0227	0.17
74	Journal	1	P<e9>rez-Navarro & Guerra	2012	50	50	15	0.25	4	⋯	0.650	0.09192	0.0224	0.1497	0.0765	0.13
75	Journal	1	P<e9>rez-Navarro & Cox - exp1	2012	60	60	20	0.25	4	⋯	1.340	0.17299	0.0198	0.1405	0.1602	0.12
75	Journal	1	P<e9>rez-Navarro & Cox - exp2	2012	90	90	24	0.25	4	⋯	0.240	0.02530	0.0116	0.1076	0.0168	0.09
75	Journal	1	P<e9>rez-Navarro & Cox - exp3	2012	55	55	18	0.25	4	⋯	1.170	0.15776	0.0213	0.1461	0.1438	0.13
76	Journal	1	Roe, Cooper, et al. - expt 1	2010	40	40	14	0.25	4	⋯	1.280	0.20239	0.0303	0.1742	0.1830	0.15
76	Journal	1	Roe, Cooper, et al. - expt 2	2014	30	30	13	0.25	4	⋯	2.110	0.38523	0.0437	0.2089	0.3591	0.18

Study	Type.of.Publication	Publication.rank	Author	Year	n_participants	trials	hits	MCE	Nchoice	⋯	Z	ES	Var	SE	ESg	S
<int>	<chr>	<int>	<chr>	<int>	<int>	<int>	<int>	<dbl>	<int>	⋯	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dl
76	Journal	1	Roe, Cooper, et al. - expt 3	2012	40	40	16	0.25	4	⋯	2.010	0.31781	0.0320	0.1789	0.2985	0.15
77	Journal	1	Watt, Dawson, Tullo, Pooley & Rice	2020	60	60	22	0.25	4	⋯	1.940	0.25045	0.0206	0.1437	0.2377	0.13
78	Journal	1	Carde<f1>a & Marcusson-Clavertz	2020	35	35	8	0.25	4	⋯	-0.100	-0.01690	0.0269	0.1639	-0.0391	0.14

Z scores and p values for Honorton & Harper (1974) paper

In [2]:
```
library(crayon)


cat(black$bold("Z scores and p values for Honorton & Harper (1974) paper", "\n", "\n"))

# give the same value as with Z computed by vassarstats.net/binomialX.html

Z_Study1 <- ((data$hits[1] - (data$trials[1]*(1/data$Nchoice[1])) - 0.5)
             / sqrt(data$trials[1]*(1/data$Nchoice[1])*(1-(1/data$Nchoice[1]))))

cat(blue$bold("Z =", Z_Study1,"\n"))
cat("This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html", "\n", "\n")


#pnorm(Z_v1, 0, 1, lower.tail=FALSE)

pnorm_Study1 <- pnorm(Z_Study1, 0, 1, lower.tail=FALSE)

cat(blue$bold("P_method2 =", pnorm_Study1,"\n"))
cat(blue("one-tailed  p value according to ")) +
cat(blue$bold("'Method 2. approximation via normal' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n", "\n")


#Z_method2_Study1 <- qnorm(pnorm_v1, 0, 1, lower.tail=FALSE)
#cat("N.B.: Z score back from  P_method2 p =", Z_method2_Study1, "\n", "\n")


# Performs an exact test of a simple null hypothesis about the probability of success in a Bernoulli experiment.


res_Study1 <- binom.test(data$hits[1], data$trials[1], p = 1/data$Nchoice[1],
        alternative = "greater",
        conf.level = 0.95)

cat(green("P_method1 =", res_Study1$p.value,"\n"))
cat(green("one-tailed  p value according to 'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n")


# p value one-tailed according to  "Method 1. exact binomial calculation" in vassarstats.net/binomialX.html
Z_method1_Study1 <- qnorm(res_Study1$p.value, 0, 1, lower.tail=FALSE)
cat(green("Z from P_method1 =",Z_method1_Study1,"\n"))
cat("counterpart Z score of P value from method 1", "\n")
```

Z scores and p values for Honorton & Harper (1974) paper

Z = 2.10818510677892
This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html

P_method2 = 0.0175074905098313
one-tailed p value according to **'Method 2. approximation via normal' in vassarstats.net/binomialX.html**

probability of the observed hits or more out of the number of trials in the study

P_method1 = 0.0215936408798555
one-tailed p value according to 'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html
probability of the observed hits or more out of the number of trials in the study
Z from P_method1 = 2.02189421290958
counterpart Z score of P value from method 1

Z scores and p values for Braud, Wood & Braud (1975) paper

In [3]:

```r
cat(black$bold("Z scores and p values for Braud, Wood & Braud (1975) paper", "\n", "\n"))

# give the same value as with Z computed by vassarstats.net/binomialX.html

Z_Study2 <- ((data$hits[2] - (data$trials[2]*(1/data$Nchoice[2])) - 0.5)
             / sqrt(data$trials[2]*(1/data$Nchoice[2])*(1-(1/data$Nchoice[2]))))

cat(blue("Z =", Z_Study2,"\n"))
cat("This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html", "\n", "\n")


#pnorm(Z_v1, 0, 1, lower.tail=FALSE)

pnorm_Study2 <- pnorm(Z_Study2, 0, 1, lower.tail=FALSE)

cat(blue("P_method2 =", pnorm_Study2,"\n"))
cat(blue("one-tailed  p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n", "\n")


#Z_method2_Study2 <- qnorm(pnorm_v1, 0, 1, lower.tail=FALSE)
#cat("N.B.: Z score back from  P_method2 p =", Z_method2_Study2, "\n", "\n")


# Performs an exact test of a simple null hypothesis about the probability of success in a Bernoulli experiment.

res_Study2 <- binom.test(data$hits[2], data$trials[2], p = 1/data$Nchoice[2],
        alternative = "greater",
        conf.level = 0.95)

cat(green$bold("P_method1 =", res_Study2$p.value,"\n"))
cat(green("one-tailed  p value according to")) +
cat(green$bold("'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n")


# p value one-tailed according to  "Method 1. exact binomial calculation" in vassarstats.net/binomialX.html
Z_method1_Study2 <- qnorm(res_Study2$p.value, 0, 1, lower.tail=FALSE)
cat(green$bold("Z from P_method1 =",Z_method1_Study2,"\n"))
cat("counterpart Z score of P value from method 1", "\n")
```

Z scores and p values for Braud, Wood & Braud (1975) paper

Z = 0.707106781186548
This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html

P_method2 = 0.239750061093477
one-tailed p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html
probability of the observed hits or more out of the number of trials in the study

P_method1 = 0.224773202128741
one-tailed p value according to**'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html**

probability of the observed hits or more out of the number of trials in the study
Z from P_method1 = 0.75617145593943
counterpart Z score of P value from method 1

Z scores and p values for Palmer & Aued (1975) paper

In [4]:

```r
cat(black$bold("Z scores and p values for Palmer & Aued (1975) paper", "\n", "\n"))

# give the same value as with Z computed by vassarstats.net/binomialX.html

Z_Study3 <- ((data$hits[3] - (data$trials[3]*(1/data$Nchoice[3])) - 0.5)
             / sqrt(data$trials[3]*(1/data$Nchoice[3])*(1-(1/data$Nchoice[3]))))

cat(blue("Z =", Z_Study3,"\n"))
cat("This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html", "\n", "\n")


pnorm_Study3 <- pnorm(Z_Study3, 0, 1, lower.tail=FALSE)

cat(blue("P_method2 =", pnorm_Study3,"\n"))
cat(blue("one-tailed  p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n", "\n")


#Z_method2_Study3 <- qnorm(pnorm_v1, 0, 1, lower.tail=FALSE)
#cat("N.B.: Z score back from  P_method2 p =", Z_method2_Study3, "\n", "\n")


# Performs an exact test of a simple null hypothesis about the probability of success in a Bernoulli experiment.

res_Study3 <- binom.test(data$hits[3], data$trials[3], p = 1/data$Nchoice[3],
        alternative = "greater",
        conf.level = 0.95)

cat(green$bold("P_method1 =", res_Study3$p.value,"\n"))
cat(green("one-tailed  p value according to")) +
cat(green$bold("'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n")


# p value one-tailed according to  "Method 1. exact binomial calculation" in vassarstats.net/binomialX.html
Z_method1_Study3 <- qnorm(res_Study3$p.value, 0, 1, lower.tail=FALSE)
cat(green$bold("Z from P_method1 =",Z_method1_Study3,"\n"))
cat("counterpart Z score of P value from method 1", "\n")
```

Z scores and p values for Palmer & Aued (1975) paper

Z = -1.27801930084539
This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html

P_method2 = 0.899378689521138
one-tailed p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html
probability of the observed hits or more out of the number of trials in the study

P_method1 = 0.903775406518895
one-tailed p value according to**'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html**

probability of the observed hits or more out of the number of trials in the study
Z from P_method1 = -1.30336790898609
counterpart Z score of P value from method 1

Z scores and p values for Honorton (1976) paper

In [5]:
```
cat(black$bold("Z scores and p values for Honorton (1976) paper", "\n", "\n"))

# give the same value as with Z computed by vassarstats.net/binomialX.html

Z_Study4 <- ((data$hits[4] - (data$trials[4]*(1/data$Nchoice[4])) - 0.5)
             / sqrt(data$trials[4]*(1/data$Nchoice[4])*(1-(1/data$Nchoice[4]))))

cat(blue("Z =", Z_Study4,"\n"))
cat("This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html", "\n", "\n")


pnorm_Study4 <- pnorm(Z_Study4, 0, 1, lower.tail=FALSE)

cat(blue("P_method2 =", pnorm_Study4,"\n"))
cat(blue("one-tailed  p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n", "\n")


#Z_method2_Study3 <- qnorm(pnorm_v1, 0, 1, lower.tail=FALSE)
#cat("N.B.: Z score back from  P_method2 p =", Z_method2_Study3, "\n", "\n")


# Performs an exact test of a simple null hypothesis about the probability of success in a Bernoulli experiment.

res_Study4 <- binom.test(data$hits[4], data$trials[4], p = 1/data$Nchoice[4],
        alternative = "greater",
        conf.level = 0.95)

cat(green$bold("P_method1 =", res_Study4$p.value,"\n"))
cat(green("one-tailed  p value according to")) +
cat(green$bold("'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html", "\n"))
cat("probability of the observed hits or more out of the number of trials in the study", "\n")


# p value one-tailed according to  "Method 1. exact binomial calculation" in vassarstats.net/binomialX.html
Z_method1_Study4 <- qnorm(res_Study4$p.value, 0, 1, lower.tail=FALSE)
cat(green$bold("Z from P_method1 =", Z_method1_Study4,"\n"))
cat("counterpart Z score of P value from method 1", "\n")
```

```
Z scores and p values for Honorton (1976) paper

Z = 3.27326835353989
This Z value is the same as the one eventually displayed by vassarstats.net/binomialX.html

P_method2 = 0.000531557458579302
one-tailed  p value according to 'Method 2. approximation via normal' in vassarstats.net/binomialX.html
probability of the observed hits or more out of the number of trials in the study

P_method1 = 0.0013427734375
one-tailed  p value according to'Method 1. exact binomial calculation' in vassarstats.net/binomialX.html

probability of the observed hits or more out of the number of trials in the study
Z from P_method1 = 3.0016114794857
counterpart Z score of P value from method 1
```

In [ ]:

Descriptive data for GZ 1974-2020

In [7]:
```
install.packages("psych")
library(psych)
library(dplyr)
```

```
Mise à jour de la liste HTML des packages dans '.Library'

Making 'packages.html' ...
 terminé


Attachement du package : ‘psych’


L'objet suivant est masqué depuis ‘package:crayon’:

    %+%


Warning message:
“le package ‘dplyr’ a été compilé avec la version R 4.2.3”

Attachement du package : ‘dplyr’
```

In [15]:
```
WeightedHitRate <- weighted.mean(data$HitRate, data$trials)
WeightedHitRate
```

0.313989237760793

In [16]:

```
trials <-   describe(data$trials)
trials <- round(trials[grepl("mean|min|max|sd", names(trials))],3)

HitRate <-   describe(data$HitRate)
HitRate <- round(HitRate[grepl("mean|min|max|sd", names(HitRate))],3)


library(data.table)

trials <- transpose(trials)
HitRate <- transpose(HitRate)


GZ19742020 <- cbind(trials, HitRate)

rownames(GZ19742020) <- c("Mean","Sd","Min","Max")
colnames(GZ19742020) <- c("Trials","HitRate")

GZ19742020
```

```
Attachement du package : ‘data.table’


Les objets suivants sont masqués depuis ‘package:dplyr’:

    between, first, last
```

A data.frame: 4 × 2

	Trials	HitRate
	<dbl>	<dbl>
Mean	42.841	0.315
Sd	27.268	0.114
Min	4.000	0.000
Max	138.000	0.857

Descriptive data for GZ 1987-2020

In [8]:
```
data2 <- filter(data, Year>1987)
```

In [18]:
```
WeightedHitRate2 <- weighted.mean(data2$HitRate, data2$trials)
WeightedHitRate2
```

0.311009041394336

In [19]:

```
#data2 <- filter(data, Year>1987)


trials <-   describe(data2$trials)
trials <- round(trials[grepl("mean|min|max|sd", names(trials))],3)

HitRate <-   describe(data2$HitRate)
HitRate <- round(HitRate[grepl("mean|min|max|sd", names(HitRate))],3)


library(data.table)

trials <- transpose(trials)
HitRate <- transpose(HitRate)


GZ19872020 <- cbind(trials, HitRate)

rownames(GZ19872020) <- c("Mean","Sd","Min","Max")
colnames(GZ19872020) <- c("Trials","HitRate")

GZ19872020
```

A data.frame: 4 × 2

	Trials	HitRate
	<dbl>	<dbl>
Mean	46.481	0.305
Sd	29.137	0.094
Min	4.000	0.091
Max	138.000	0.500

Descriptive data for GZ 1987-2020 Selected participants

In [9]:
```
data3  <-  filter(data2, participantsSel==1)
```

In [21]:
```
WeightedHitRate3 <- weighted.mean(data3$HitRate, data3$trials)
WeightedHitRate3
```

0.344201086218601

In [22]:
```
#data3  <-  filter(data2, participantsSel==1)

trials <-   describe(data3$trials)
trials <- round(trials[grepl("mean|min|max|sd", names(trials))],3)

HitRate <-   describe(data3$HitRate)
HitRate <- round(HitRate[grepl("mean|min|max|sd", names(HitRate))],3)


library(data.table)

trials <- transpose(trials)
HitRate <- transpose(HitRate)


GZ19872020Sel <- cbind(trials, HitRate)

rownames(GZ19872020Sel) <- c("Mean","Sd","Min","Max")
colnames(GZ19872020Sel) <- c("Trials","HitRate")

GZ19872020Sel
```

A data.frame: 4 × 2

	Trials	HitRate
	<dbl>	<dbl>
Mean	46.031	0.328
Sd	25.803	0.099
Min	16.000	0.119
Max	138.000	0.500

In [ ]: