# Package: statAPA (via r-universe)

May 17, 2026

**Type** Package

**Title** APA 7th Edition Statistical Tables, Plots, and Multilevel Model Reports

**Version** 0.1.0

**Description** Produces publication-ready statistical tables and figures formatted according to the 7th edition of the American Psychological Association (APA) style guidelines. Supports descriptive statistics, t-tests, z-tests, chi-square tests, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), two-way ANOVA with simple effects, Multivariate Analysis of Variance (MANOVA), robust and cluster-robust regression using Heteroscedasticity-Consistent (HC) standard errors, post-hoc pairwise comparisons, homoskedasticity and heteroscedasticity diagnostics including the Non-Constant Variance (NCV) test, proportion tests, and multilevel mixed-effects models with intraclass correlation coefficients (ICC) and model-comparison tables. Output can be directed to the console, Microsoft Word (via 'officer' and 'flextable'), or LaTeX. For APA style guidelines see American Psychological Association (2020, ISBN:978-1-4338-3216-1).

**License** MIT + file LICENSE

**Encoding** UTF-8

**Language** en-US

**LazyData** true

**RoxygenNote** 7.3.3

**Depends** R (>= 4.1.0)

**Imports** stats, utils, ggplot2 (>= 3.4.0), rlang, emmeans (>= 1.8.0), lme4 (>= 1.1-30), lmtest (>= 0.9-40), sandwich (>= 3.0-0), car (>= 3.1-0), officer (>= 0.6.0), flextable (>= 0.9.0)

**Suggests** lmerTest (>= 3.1-3), MuMIn (>= 1.47.0), ggeffects (>= 1.3.0), knitr, rmarkdown, testthat (>= 3.0.0)

**VignetteBuilder** knitr

**URL** https://github.com/causalfragility-lab/statAPA

**BugReports** https://github.com/causalfragility-lab/statAPA/issues

**Config/pak/sysreqs**
libcairo2-dev cmake libfontconfig1-dev libfreetype6-dev libfribidi-dev make libharfbuzz-dev libicu-dev libjpeg-dev libpng-dev libtiff-dev libuv1-dev libwebp-dev libxml2-dev libssl-dev

**Repository** https://causalfragility-lab.r-universe.dev

**Date/Publication** 2026-04-11 19:58:04 UTC

**RemoteUrl** https://github.com/causalfragility-lab/statapa

**RemoteRef** HEAD

**RemoteSha** 035ca7fc1b87028c4c234213c1b4158c8fca7dfb

# Contents

apa_ancova *APA 7-style Analysis of Covariance (ANCOVA) table with adjusted means*

## Description

Fits an Analysis of Covariance (ANCOVA) model and produces an APA-formatted table of the omnibus F-tests together with a second table of covariate-adjusted marginal means for the focal factor. Validates that the covariate(s) are continuous and not involved in an interaction with the focal factor (a key ANCOVA assumption).

## Usage

```
apa_ancova(
  formula,
  data,
  covariate,
  focal,
  type = c("II", "III"),
  es = c("partial_eta2", "eta2", "omega2"),
  conf_level = 0.95,
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "ANCOVA Results"
)
```

## Arguments

| | |
|---|---|
| formula | A model formula, e.g. `y ~ group + covariate` or `y ~ group + covariate1 + covariate2`. |
| data | A data frame containing the variables in `formula`. |
| covariate | Character vector naming the covariate column(s) in `data`. Used for validation and labelling. |
| focal | Character scalar: the name of the focal (grouping) factor whose adjusted means will be reported. |
| type | Sums-of-squares type: `"II"` (default) or `"III"`. |
| es | Effect size to report: `"eta2"`, `"partial_eta2"` (default), or `"omega2"`. |
| conf_level | Confidence level for adjusted-means intervals (default `0.95`). |
| output | Output target: `"console"`, `"word"`, or `"latex"`. |
| file | Path for Word output when `output = "word"`. |
| table_title | Optional caption for the omnibus table (default `"ANCOVA Results"`). |

## Details

Analysis of Covariance (ANCOVA) partitions variance in a continuous outcome into effects of a grouping factor and one or more continuous covariates, reducing error variance and yielding covariate-adjusted group comparisons. The adjusted means reported here are estimated marginal means (via **emmeans**) evaluated at the mean(s) of the covariate(s). Homogeneity of regression slopes (no covariate-by-group interaction) is assumed; this function warns if it detects an interaction term involving the covariate and the focal factor in the formula.

## Value

Invisibly returns a list with elements:

`model` The fitted `lm` object.

`anova_table` A `data.frame` of the omnibus Analysis of Covariance (ANCOVA) results with columns `Source`, `SS` (Sum of Squares), `df`, `MS` (Mean Square), `F`, `p`, and the chosen effect-size column.

`adjusted_means` A `data.frame` of covariate-adjusted marginal means for `focal`, from `emmeans::emmeans()`, with columns `focal`, `Adjusted M` (adjusted mean), `SE`, and `95% CI`.

`note` A character string with the APA-style table note.

The function is called primarily for its side effect of printing or writing the tables.

## Examples

```
# ANCOVA: mpg ~ cyl (factor) + wt (covariate)
mtcars2 <- mtcars
mtcars2$cyl <- factor(mtcars2$cyl)
result <- apa_ancova(
  mpg ~ cyl + wt,
  data      = mtcars2,
  covariate = "wt",
  focal     = "cyl"
)
str(result$adjusted_means)
```

---

`apa_anova` *APA 7-style ANOVA / ANCOVA table (Type II/III) with effect sizes*

---

## Description

APA 7-style ANOVA / ANCOVA table (Type II/III) with effect sizes

## Usage

```
apa_anova(
  model,
  data = NULL,
  type = c("II", "III"),
  es = c("eta2", "partial_eta2", "omega2"),
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "ANOVA Results"
)
```

## Arguments

| | |
|---|---|
| `model` | An `lm`/`aov` object or a formula with `data`. |
| `data` | Optional data if you pass a formula. |
| `type` | "II" or "III" (default "II"). |
| `es` | Effect size to report: "eta2", "partial_eta2", or "omega2". |
| `output` | "console", "word", or "latex". |
| `file` | Path for Word output (when `output = "word"`). |
| `table_title` | Optional caption title (default "ANOVA Results"). |

## Value

Invisibly returns a list with two components:

`anova` The full ANOVA table as returned by `car::Anova()`, including all rows.

`table` A `data.frame` formatted for APA output, with columns `Source`, `SS` (Sum of Squares), `df` (degrees of freedom), `MS` (Mean Square), `F` (F-statistic), `p` (formatted p-value), and the chosen effect-size column (`eta2`, `partial_eta2`, or `omega2`).

When `output = "latex"`, the list also contains a `latex` element with the LaTeX table string. The function is called primarily for its side effect of printing or writing the table.

## Examples

```
fit <- lm(mpg ~ factor(cyl) + wt, data = mtcars)
result <- apa_anova(fit)
str(result$table)
```

apa_chisq *APA chi-square test (goodness-of-fit or independence) with Cramer's V / phi*

## Description

APA chi-square test (goodness-of-fit or independence) with Cramer's V / phi

## Usage

```
apa_chisq(
  x,
  p = NULL,
  correct = FALSE,
  simulate.p.value = FALSE,
  B = 2000,
  output = c("console", "list")
)
```

## Arguments

| | |
|---|---|
| x | Either a contingency table/matrix (independence test), or a vector of observed counts (goodness-of-fit test). |
| p | A vector of expected probabilities for goodness-of-fit (ignored for independence). |
| correct | Logical, Yates continuity correction for 2x2 tables (default FALSE). |
| simulate.p.value | Logical, use Monte Carlo simulation (passed to [stats::chisq.test]). |
| B | Number of replicates for simulation (passed to [stats::chisq.test]). |
| output | One of "console" or "list". "console" prints an APA-formatted summary to the console; "list" returns the result invisibly without printing. |

## Value

A list with two elements:

table A data.frame with one row containing columns Test (test name), Stat (chi-square statistic), df (degrees of freedom), p (formatted p-value), Effect (name of effect size: "V" for Cramer's V or "phi" for the phi coefficient), and Value (the numeric effect-size estimate).

note A character string with the APA-style table note.

## Examples

```
# Independence test
m <- matrix(c(30, 10, 20, 40), nrow = 2)
apa_chisq(m)

# Goodness-of-fit test
apa_chisq(c(50, 30, 20), p = c(0.5, 0.3, 0.2))
```

---

# apa_descriptives *APA 7-style descriptive statistics table*

---

## Description

APA 7-style descriptive statistics table

## Usage

```
apa_descriptives(
  data,
  vars,
  group = NULL,
  digits = 2,
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = NULL
)
```

## Arguments

| | |
|---|---|
| data | Data frame. |
| vars | Character vector of variable names to summarize. |
| group | Optional single grouping variable name in data. |
| digits | Decimals for means/SDs. |
| output | "console", "word", or "latex". |
| file | Path for Word output (when output = "word"). |
| table_title | Optional caption; defaults to "Descriptive Statistics" or "Descriptive Statistics by group". |

## Value

Invisibly returns a list with two elements:

descriptives_df A data.frame with one row per variable. Without grouping, columns are Variable, M (mean), SD (standard deviation), and N (number of non-missing observations). With grouping, there is one M (SD) column per group level plus a Total: M (SD) column and N.

note A character string with the APA-style table note.

When output = "latex", the list additionally contains a latex element with the LaTeX table string. The function is called primarily for its side effect of printing or writing the table.

## Examples

```
result <- apa_descriptives(mtcars, vars = c("mpg", "wt", "hp"))
str(result$descriptives_df)

result_grp <- apa_descriptives(mtcars, vars = c("mpg", "wt"),
                               group = "cyl")
str(result_grp$descriptives_df)
```

---

# apa_hetero *APA-Style Heteroscedasticity Diagnostics*

---

## Description

Runs a studentized Breusch-Pagan test (lmtest::bptest) and, if available, the Non-Constant Variance (NCV) test (car::ncvTest), and prints results in APA format.

## Usage

```
apa_hetero(model, output = c("console", "word", "latex"), file = NULL)
```

## Arguments

| | |
|---|---|
| model | Fitted lm or glm object. |
| output | Output target: one of "console", "word", or "latex". |
| file | Path for Word output if output = "word". |

## Details

The Breusch-Pagan test examines whether the variance of residuals depends on fitted values. The Non-Constant Variance (NCV) test (if available via the **car** package) performs a similar check using a score test. Both are useful for detecting heteroscedasticity in regression models.

## Value

Invisibly returns a data.frame of test results with columns:

Test Name of the test run (e.g., "Breusch-Pagan", "Non-Constant Variance (NCV)").

Stat The test statistic (formatted to 2 decimal places).

df Degrees of freedom for the test statistic.

p Formatted p-value string (e.g., "< .001").

Returns NULL invisibly if no tests could be computed. The function is called primarily for its side effect of printing or writing the table.

### Examples

```
fit <- lm(mpg ~ wt + hp, data = mtcars)
result <- apa_hetero(fit)
str(result)
```

---

## apa_homoskedasticity *Homoskedasticity check (APA-style summary)*

---

### Description

Reports whether common tests fail to detect heteroskedasticity, i.e., results are consistent with homoskedastic errors. Internally runs Breusch-Pagan and White tests via **lmtest**. Optionally runs Levene/Brown-Forsythe via **car** if a grouping factor is supplied.

### Usage

```
apa_homoskedasticity(
  model,
  group = NULL,
  center = c("mean", "median"),
  alpha = 0.05,
  output = c("console", "word", "latex"),
  file = NULL
)
```

### Arguments

| | |
|---|---|
| `model` | Fitted `lm` or `glm` object. |
| `group` | Optional grouping factor (for Levene/Brown-Forsythe). If provided, `car::leveneTest` will be attempted. |
| `center` | Character for Levene center, one of `"mean"` or `"median"`. `"median"` yields Brown-Forsythe. |
| `alpha` | Significance level for the textual conclusion (default 0.05). |
| `output` | "console", "word", or "latex". |
| `file` | Path for Word output when `output = "word"`. |

### Value

Invisibly returns a `data.frame` of test results with columns:

`Test` Name of the test run (e.g., `"Breusch-Pagan"`, `"White (BP with fitted + fitted^2)"`, `"Levene (mean)"`, or `"Brown-Forsythe (Levene, median)"`).

`Stat` The numeric test statistic.

`df` Degrees of freedom (may be `NA` for some tests).

p The raw p-value.

Returns NULL invisibly if no tests could be computed. The function is called primarily for its side effect of printing or writing the table.

## Examples

```
fit <- lm(mpg ~ wt + cyl, data = mtcars)
result <- apa_homoskedasticity(fit, output = "console")
str(result)
```

---

apa_manova *APA 7-style Multivariate Analysis of Variance (MANOVA) table*

---

## Description

Runs a one-way or factorial Multivariate Analysis of Variance (MANOVA) and produces an APA-formatted summary table. Reports all four multivariate test statistics (Pillai's trace, Wilks' lambda, Hotelling-Lawley trace, and Roy's largest root) together with approximate F-statistics, degrees of freedom, p-values, and eta-squared effect sizes.

## Usage

```
apa_manova(
  formula,
  data,
  type = c("II", "III"),
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "MANOVA Results"
)
```

## Arguments

| | |
|---|---|
| formula | A formula of the form cbind(y1, y2, ...) ~ x1 + x2. The left-hand side must use cbind() to bind the dependent variables. |
| data | A data frame containing the variables in formula. |
| type | Sums-of-squares type passed to car::Anova(): "II" (default) or "III". |
| output | Output target: "console", "word", or "latex". |
| file | Path for Word output when output = "word". |
| table_title | Optional caption (default "MANOVA Results"). |

## Details

Multivariate Analysis of Variance (MANOVA) tests whether group means differ across a set of correlated dependent variables simultaneously. Pillai's trace is the most robust statistic and is recommended when assumptions may be violated. Wilks' lambda is the most commonly reported. Hotelling-Lawley trace and Roy's largest root are sensitive to a single large discriminant function. Effect sizes (eta-squared) are approximations based on the F-approximation degrees of freedom.

## Value

Invisibly returns a list with elements:

`manova` The raw `manova` model object.

`summary` The summary list from `summary.manova()`, containing one element per test statistic (`"Pillai"`, `"Wilks"`, `"Hotelling-Lawley"`, `"Roy"`).

`table` A `data.frame` formatted for APA output with columns `Effect` (predictor name), `Test` (statistic name), `Stat` (test statistic value), `approx F`, `num df` (numerator degrees of freedom), `den df` (denominator degrees of freedom), `p` (formatted p-value), and `eta2` (eta-squared, computed as `1 - Wilks` for Wilks' lambda, else as the ratio of the hypothesis sum of squares to total).

`note` A character string with the APA-style table note.

The function is called primarily for its side effect of printing or writing the table.

## Examples

```
# One-way MANOVA: sepal and petal length by species
result <- apa_manova(
  cbind(Sepal.Length, Petal.Length) ~ Species,
  data = iris
)
str(result$table)
```

---

# apa_multilevel *APA 7-style multilevel model (mixed-effects) reporting table*

---

## Description

Produces APA-formatted tables for one or more multilevel models fitted with **lme4**. Reports fixed effects with confidence intervals, random effects (variances and standard deviations), the intraclass correlation coefficient (ICC), marginal and conditional R-squared (via **MuMIn** if available, else a manual approximation), and an optional likelihood ratio model comparison table. Supports random intercept, random slope, and cross-level interaction models.

## Usage

```
apa_multilevel(
  ...,
  model_names = NULL,
  conf_level = 0.95,
  digits = 2,
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "Multilevel Model Results"
)
```

## Arguments

| | |
|---|---|
| `...` | One or more fitted `lmerMod` or `glmerMod` objects (from **lme4**). If more than one is supplied, a likelihood ratio model-comparison table is also printed. |
| `model_names` | Optional character vector of labels for the models (same length as `...`). Defaults to `"Model 1"`, `"Model 2"`, etc. |
| `conf_level` | Confidence level for fixed-effect confidence intervals (default `0.95`). |
| `digits` | Decimal places for numeric output (default `2`). |
| `output` | Output target: `"console"`, `"word"`, or `"latex"`. |
| `file` | Path for Word output when `output = "word"`. |
| `table_title` | Optional caption for the fixed-effects table (default `"Multilevel Model Results"`). |

## Details

The intraclass correlation coefficient (ICC) quantifies the proportion of total variance that lies between clusters (Level 2 units). An ICC near 0 suggests little clustering; an ICC near 1 suggests observations within clusters are nearly identical. Marginal R-squared reflects variance explained by fixed effects alone; conditional R-squared reflects variance explained by the full model (fixed + random). When **MuMIn** is not available, R-squared is approximated following Nakagawa and Schielzeth (2013). P-values for fixed effects use Satterthwaite degrees of freedom when **lmerTest** is installed, and a normal approximation otherwise.

## Value

Invisibly returns a list with elements:

`fixed_effects` A list (one entry per model) of `data.frames` containing fixed-effect estimates, standard errors, t-values, p-values (Satterthwaite via **lmerTest** if installed, else normal approximation), and confidence intervals.

`random_effects` A list (one entry per model) of `data.frames` with random-effect group names, variance components, and standard deviations.

`icc` A named numeric vector of intraclass correlation coefficients (ICC), one per model, computed as $\sigma_u^2/(\sigma_u^2 + \sigma_e^2)$.

`r2` A `data.frame` with marginal R-squared (variance explained by fixed effects only) and conditional R-squared (variance explained by fixed + random effects) for each model. Computed via **MuMIn** if available, else a Nakagawa-Schielzeth approximation.

`model_comparison` A `data.frame` of likelihood ratio test results if more than one model is supplied, else `NULL`. Columns: `Model`, `df` (number of parameters), `AIC`, `BIC`, `logLik`, `Chi-sq`, `Chi-sq df`, `p`.

`note` A character string with the APA-style table note.

The function is called primarily for its side effect of printing or writing the tables.

## Examples

```
if (requireNamespace("lme4", quietly = TRUE)) {
  library(lme4)
  data(ECLS_demo, package = "statAPA")

  # Null model (random intercept only)
  m0 <- lmer(math ~ 1 + (1 | schid), data = ECLS_demo, REML = FALSE)

  # Add Level-1 predictor
  m1 <- lmer(math ~ SES + (1 | schid), data = ECLS_demo, REML = FALSE)

  # Random slope + cross-level interaction
  m2 <- lmer(math ~ SES * gender + (SES | schid),
             data = ECLS_demo, REML = FALSE)

  result <- apa_multilevel(m0, m1, m2,
                           model_names = c("Null", "SES", "SES x Gender"))
  str(result$icc)
  str(result$r2)
}
```

---

# apa_plot_anova *APA-style estimated marginal means plot (ANOVA / ANCOVA)*

---

## Description

Plots estimated marginal means with 95% confidence intervals for a specified factor in an Analysis of Variance (ANOVA) or Analysis of Covariance (ANCOVA) model, using **emmeans**.

## Usage

```
apa_plot_anova(model, by, conf_level = 0.95)
```

## Arguments

| | |
|---|---|
| model | Fitted lm, aov, or mixed model object that includes the factor by. |
| by | Character scalar: factor name for which to estimate and plot marginal means. |
| conf_level | Confidence level for the intervals (default 0.95). |

## Value

A ggplot object showing point estimates and error bars (95% confidence intervals) for each level of by, with theme_apa() applied.

## Examples

```
fit <- aov(mpg ~ factor(cyl), data = mtcars)
apa_plot_anova(fit, by = "cyl")
```

## apa_plot_regression *APA-style regression plot with confidence interval ribbon*

### Description

For `lm` or `glm` models: draws a fitted line with a shaded 95% confidence interval ribbon along a focal continuous predictor. If **ggeffects** is available and `by` is supplied, plots separate interaction lines with ribbons by group.

### Usage

```
apa_plot_regression(model, focal, by = NULL, conf_level = 0.95)
```

### Arguments

| | |
|---|---|
| `model` | Fitted `lm` or `glm` object. |
| `focal` | Character scalar: the focal continuous predictor to place on the x-axis (must appear in `model.frame(model)`). |
| `by` | Optional character scalar: name of a factor for separate lines (requires **ggeffects**). |
| `conf_level` | Confidence level for the interval ribbon (default 0.95). |

### Value

A `ggplot` object showing the fitted line and confidence interval ribbon for the focal predictor, with `theme_apa()` applied.

### Examples

```
fit <- lm(mpg ~ wt + hp, data = mtcars)
apa_plot_regression(fit, focal = "wt")
```

## apa_plot_residuals *APA-style residual diagnostic plots*

### Description

Produces either a Residuals vs Fitted plot or a Normal Q-Q plot for a fitted model, styled with `theme_apa()`.

### Usage

```
apa_plot_residuals(model, type = c("rvf", "qq"))
```

### Arguments

| | |
|---|---|
| model | Fitted lm, glm, or lmerMod object. |
| type | One of "rvf" (Residuals vs Fitted; default) or "qq" (Normal Q-Q plot). |

### Value

A ggplot object. For type = "rvf": residuals on the y-axis versus fitted values on the x-axis. For type = "qq": standardized residuals plotted against theoretical normal quantiles with a 45-degree reference line.

### Examples

```
fit <- lm(mpg ~ wt + hp, data = mtcars)
apa_plot_residuals(fit, type = "rvf")
apa_plot_residuals(fit, type = "qq")
```

---

## apa_posthoc *APA 7-style post-hoc pairwise comparisons (emmeans)*

---

### Description

Produces APA-formatted pairwise comparisons of estimated marginal means. Works with lm/glm/lmer/glmer/aov models. Requires the factor by to be in the model and have at least 2 levels. Supports multiple contrast methods (e.g., "pairwise", "revpairwise", "trt.vs.ctrl") and p-value adjust options ("tukey", "bonferroni", "holm", "sidak", etc.).

### Usage

```
apa_posthoc(
  model,
  by,
  method = "pairwise",
  adjust = "tukey",
  conf_level = 0.95,
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "Post-hoc Pairwise Comparisons"
)
```

### Arguments

| | |
|---|---|
| model | Fitted model (aov/lm/glm/lmer/ glmer). |
| by | Character scalar: factor name to compare (must be in the model). |
| method | Character: contrast type for emmeans::contrast() (default "pairwise"). |
| adjust | Character: multiplicity correction method (default "tukey"). |
| conf_level | Numeric in (0,1): confidence level for confidence intervals (default .95). |

| | |
|---|---|
| output | "console", "word", or "latex". |
| file | Path for Word output (used when output = "word"). |
| table_title | Optional caption for the table (default "Post-hoc Pairwise Comparisons"). |

## Value

Invisibly returns a list with two elements:

pairs A data.frame of all pairwise contrasts as returned by summary(emmeans::contrast(...)), with columns including contrast (pair label), estimate (mean difference), SE (standard error), the test statistic (t.ratio or z.ratio depending on the model), df, p.value (adjusted), and lower.CL/upper.CL (confidence interval bounds).

note A character string with the APA-style table note describing the contrast method, adjustment, and confidence level.

When output = "latex", the list also contains a latex element with the LaTeX table string. Returns NULL invisibly if the factor has fewer than 2 levels. The function is called primarily for its side effect of printing or writing the table.

## Examples

```
fit <- aov(mpg ~ factor(cyl), data = mtcars)
result <- apa_posthoc(fit, by = "cyl")
str(result$pairs)
```

---

# apa_prop_test *APA proportion test (one- or two-sample) with optional risk difference, risk ratio, and odds ratio*

---

## Description

APA proportion test (one- or two-sample) with optional risk difference, risk ratio, and odds ratio

## Usage

```
apa_prop_test(
  x,
  n,
  y = NULL,
  m = NULL,
  p0 = NULL,
  correct = TRUE,
  conf.level = 0.95,
  output = c("silent", "console")
)
```

### Arguments

| | |
|---|---|
| x | Successes (length 1 for one-sample; length 2 for two-sample). |
| n | Trials (length 1 for one-sample; length 2 for two-sample). |
| y | Deprecated: if supplied together with m, will be bound into x. |
| m | Deprecated: if supplied together with y, will be bound into n. |
| p0 | Null proportion for one-sample; MUST be NULL for two-sample. |
| correct | Logical, continuity correction (passed to stats::prop.test). |
| conf.level | Confidence level for intervals (default 0.95). |
| output | "console" to print an APA-formatted summary to the console; "silent" returns invisibly without printing. |

### Value

Invisibly returns a list with two elements:

table A data.frame with one row containing columns Test (description of the test), Estimate (sample proportion or difference), 95% CI (confidence interval string), Stat (chi-square statistic), df, p (formatted p-value), RD (risk difference with CI, two-sample only), RR (risk ratio with CI, two-sample only), and OR (odds ratio with CI, two-sample only). One-sample rows have empty strings for RD, RR, and OR.

note A character string with the APA-style table note describing abbreviations and methods used.

### Examples

```
# One-sample: test whether proportion equals 0.5
apa_prop_test(x = 35, n = 50, p0 = 0.5, output = "console")

# Two-sample: compare two groups
apa_prop_test(x = c(30, 20), n = c(50, 50), output = "console")
```

---

## apa_resid_plots *Quick residual plots (helper)*

---

### Description

Prints Residuals vs Fitted and Normal Q-Q plots using APA theme helpers.

### Usage

```
apa_resid_plots(model)
```

### Arguments

| | |
|---|---|
| model | Fitted lm/glm/lmerMod. |

## Value

No return value; called for its side effect of printing two diagnostic plots (Residuals vs Fitted and Normal Q-Q) to the active graphics device.

---

`apa_robust` *APA-Style Regression Table with Robust or Clustered Standard Errors*

---

## Description

Generates an APA-formatted regression table using Heteroscedasticity-Consistent (HC) or cluster-robust standard errors via **sandwich** and **lmtest**.

## Usage

```
apa_robust(
  model,
  type = c("HC3", "HC1", "HC0", "HC2", "HC4", "HC4m", "HC5"),
  cluster = NULL,
  output = c("console", "word", "latex"),
  file = NULL
)
```

## Arguments

| | |
|---|---|
| `model` | Fitted `lm` or `glm` object. |
| `type` | Heteroscedasticity-Consistent (HC) estimator type, one of `"HC0"`, `"HC1"`, `"HC2"`, `"HC3"` (default), `"HC4"`, `"HC4m"`, `"HC5"`. Ignored if `cluster` is provided. |
| `cluster` | Optional vector/factor (length = observations in the model) for one-way cluster-robust standard errors. |
| `output` | Output target: `"console"`, `"word"`, or `"latex"`. |
| `file` | Path for Word output if `output = "word"`. |

## Value

Invisibly returns a list with two elements:

`table` A `data.frame` of formatted fixed-effects results with columns `Predictor`, `b` (unstandardized coefficient), `SE` (standard error), `t` (t- or z-statistic), `p` (formatted p-value), and `95% CI` (confidence interval string based on normal approximation).

`vcov` The variance-covariance matrix used (either the Heteroscedasticity-Consistent (HC) or cluster-robust matrix from **sandwich**).

The function is called primarily for its side effect of printing or writing the table.

## Examples

```
fit <- lm(mpg ~ wt + hp, data = mtcars)
result <- apa_robust(fit)           # HC3 standard errors (default)
str(result$table)

result_cl <- apa_robust(fit, cluster = mtcars$cyl)  # cluster-robust
str(result_cl$table)
```

---

`apa_t_test` *APA t-Test (one-sample, two-sample, or paired)*

---

## Description

Runs a t-test and returns an APA-styled result object suitable for printing in the console or conversion to a flextable via `apa_to_flextable()`.

## Usage

```
apa_t_test(
  x,
  y = NULL,
  mu = 0,
  paired = FALSE,
  var.equal = FALSE,
  conf.level = 0.95,
  output = c("silent", "console")
)
```

## Arguments

| | |
|---|---|
| `x` | Numeric vector of data (group 1 for two-sample; or the single sample). |
| `y` | Optional numeric vector of data (group 2 for two-sample; or paired partner for `paired = TRUE`). |
| `mu` | Null hypothesis mean for one-sample/paired tests. Default = 0. |
| `paired` | Logical. If `TRUE`, performs a paired t-test (requires `x` and `y`). |
| `var.equal` | Logical. If `TRUE`, assumes equal variances for two-sample test (pooled t). |
| `conf.level` | Confidence level for interval(s). Default = 0.95. |
| `output` | If `"console"`, prints a formatted APA table to the console via `message()`. `"silent"` returns invisibly without any console output. |

## Value

Invisibly returns a list with two elements:

`table` A `data.frame` with one row and columns `Test` (label identifying the test type), `Estimate` (sample mean, mean difference, or mean of differences), `95% CI` (confidence interval string for the estimate), `t` (t-statistic), `df` (degrees of freedom; Welch df for unequal-variance tests), `p` (formatted p-value), and `g` (Hedges' g effect size).

`note` A character string with the APA-style table note.

This list is compatible with `apa_to_flextable()` for export to Word or PowerPoint.

## Examples

```
# One-sample
apa_t_test(mtcars$mpg, mu = 20, output = "console")

# Two-sample (Welch)
apa_t_test(mtcars$mpg[mtcars$am == 0], mtcars$mpg[mtcars$am == 1],
           output = "console")

# Paired
apa_t_test(sleep$extra[sleep$group == 1],
           sleep$extra[sleep$group == 2],
           paired = TRUE, output = "console")
```

---

# apa_table *APA 7-style regression / multilevel model table*

---

## Description

APA 7-style regression / multilevel model table

## Usage

```
apa_table(
  model,
  output = c("console", "word", "latex"),
  file = NULL,
  conf_level = 0.95,
  digits = 2,
  cluster_id = NULL,
  show_random = TRUE,
  table_title = NULL
)
```

### Arguments

| | |
|---|---|
| model | Fitted model: lm, glm, lmer, or glmer. |
| output | "console", "word", or "latex". |
| file | Path for Word output (when output = "word"). |
| conf_level | Confidence level for confidence intervals (default .95). |
| digits | Decimal places for numeric columns (default 2). |
| cluster_id | Optional cluster vector (for reporting level-2 N in multilevel models). |
| show_random | Logical; include random effects and intraclass correlation coefficient (ICC) if a mixed model is supplied. |
| table_title | Optional caption; autogenerated if NULL. |

### Value

Invisibly returns a list with the following elements:

fixed_effects A data.frame of fixed-effect estimates with columns term, estimate, se, stat, p, ci_low, and ci_high.

random_effects A list with var_between, var_within, and ICC (intraclass correlation coefficient), or NULL for non-mixed models.

sample_info A list with N_level1 and N_level2 (number of observations and clusters, respectively).

p_method A character string describing the method used to compute p-values.

note A character string with the APA-style table note.

When output = "latex", the list also contains a latex element with the LaTeX table string. The function is called primarily for its side effect of printing or writing the table.

### Examples

```
fit <- lm(mpg ~ wt + hp + factor(cyl), data = mtcars)
result <- apa_table(fit)
str(result$fixed_effects)
```

---

## apa_to_flextable *Convert an statAPA result into a flextable*

---

### Description

Converts the list/data-frame objects returned by functions such as ‘apa_table()‘, ‘apa_descriptives()‘, ‘apa_anova()‘, and ‘apa_posthoc()‘ into an APA-styled flextable ready for inclusion in Word/PowerPoint.

### Usage

```
apa_to_flextable(x, note = NULL, digits = 2)
```

### Arguments

| | |
|---|---|
| x | Output from an ‘statAPA‘ function (list or data.frame). |
| note | Optional character string printed as the table note. |
| digits | Numeric digits for rounding numeric columns (default 2). |

### Value

A flextable object styled according to APA 7e.

### Examples

```
res <- apa_table(lm(mpg ~ wt + cyl, data = mtcars))
ft  <- apa_to_flextable(res)
doc <- officer::read_docx()
doc <- flextable::body_add_flextable(doc, ft)
print(doc, target = tempfile(fileext = ".docx"))
```

---

## apa_twoway_anova *APA 7-style two-way ANOVA table with interaction and simple effects*

---

### Description

Fits a two-way factorial Analysis of Variance (ANOVA) and produces an APA-formatted omnibus table (main effects + interaction) with effect sizes. Optionally computes simple effects of factorA at each level of factorB (or vice versa) via **emmeans**.

### Usage

```
apa_twoway_anova(
  formula,
  data,
  factorA,
  factorB,
  type = c("II", "III"),
  es = c("partial_eta2", "eta2", "omega2"),
  simple_effects = TRUE,
  conf_level = 0.95,
  output = c("console", "word", "latex"),
  file = NULL,
  table_title = "Two-Way ANOVA Results"
)
```

## Arguments

| | |
|---|---|
| formula | A model formula of the form y ~ A * B or y ~ A + B + A:B. Both main effects and the interaction must be present. |
| data | A data frame containing the variables. |
| factorA | Character: name of the first factor in data. |
| factorB | Character: name of the second factor in data. |
| type | Sums-of-squares type: "II" (default) or "III". |
| es | Effect size to report: "partial_eta2" (default), "eta2", or "omega2". |
| simple_effects | Logical. If TRUE (default), compute and print simple effects of factorA at each level of factorB. |
| conf_level | Confidence level for estimated marginal means (default 0.95). |
| output | Output target: "console", "word", or "latex". |
| file | Path for Word output when output = "word". |
| table_title | Optional caption for the omnibus table (default "Two-Way ANOVA Results"). |

## Details

A two-way factorial Analysis of Variance (ANOVA) tests main effects of two factors and their interaction on a continuous outcome. When the interaction is significant it is typically more informative to inspect simple effects (the effect of one factor at each level of the other) rather than main effects alone. Simple effects are computed as one-way Analysis of Variance (ANOVA) F-tests using emmeans::joint_tests() applied within each level of factorB.

## Value

Invisibly returns a list with elements:

model The fitted lm object.

anova_table A data.frame of the omnibus two-way Analysis of Variance (ANOVA) results with columns Source (effect name), SS (Sum of Squares), df, MS (Mean Square), F, p (formatted p-value), and the chosen effect-size column (eta2, partial_eta2, or omega2).

simple_effects A data.frame of simple-effects tests of factorA within each level of factorB, or NULL if simple_effects = FALSE or computation failed. Columns match anova_table.

marginal_means A data.frame of estimated marginal means for all combinations of factorA and factorB, from emmeans::emmeans().

note A character string with the APA-style table note.

The function is called primarily for its side effect of printing or writing the tables.

## Examples

```
mtcars2 <- mtcars
mtcars2$cyl  <- factor(mtcars2$cyl)
mtcars2$gear <- factor(mtcars2$gear)
result <- apa_twoway_anova(
```

```
  mpg ~ cyl * gear,
  data    = mtcars2,
  factorA = "cyl",
  factorB = "gear"
)
str(result$anova_table)
```

---

`apa_z_test_mean` *APA z-test for mean(s) with known population standard deviation(s)*

---

## Description

APA z-test for mean(s) with known population standard deviation(s)

## Usage

```
apa_z_test_mean(
  x,
  y = NULL,
  sigma_x,
  sigma_y = NULL,
  mu = 0,
  alternative = c("two.sided", "less", "greater"),
  conf.level = 0.95,
  output = c("console", "list")
)
```

## Arguments

| | |
|---|---|
| `x` | Numeric vector (or sample 1 for a two-sample test). |
| `y` | Optional numeric vector for a two-sample z-test (independent samples). |
| `sigma_x` | Known population standard deviation for `x`. |
| `sigma_y` | Known population standard deviation for `y` (two-sample only). |
| `mu` | Null mean (one-sample) or null mean difference (two-sample); default 0. |
| `alternative` | `"two.sided"`, `"less"`, or `"greater"`. |
| `conf.level` | Confidence level (default .95). |
| `output` | `"console"` prints an APA-formatted summary to the console via `message()`; `"list"` returns the result invisibly without printing. |

## Value

A list with two elements:

`table` A `data.frame` with one row containing columns `Test` (description of the test), `Estimate` (sample mean or mean difference), `95% CI` (confidence interval string for the mean or mean difference), `stat` (z-statistic), `df` (`NA` for z-tests, which have no finite degrees of freedom), `p` (formatted p-value), and `d` (Cohen's d with 95% confidence interval, computed using the known population standard deviation(s) as a reporting convenience).

`note` A character string with the APA-style table note.

## Examples

```
# One-sample z-test
apa_z_test_mean(mtcars$mpg, sigma_x = 6, mu = 20, output = "console")

# Two-sample z-test
x1 <- mtcars$mpg[mtcars$am == 0]
x2 <- mtcars$mpg[mtcars$am == 1]
apa_z_test_mean(x1, y = x2, sigma_x = 6, sigma_y = 6, output = "console")
```

---

`ECLS_demo` *ECLS_demo: Compact, simulated ECLS-K-style dataset*

---

## Description

A small, simulated, school-clustered dataset used in package examples and the vignette.

## Usage

```
data(ECLS_demo)
```

## Format

A data frame with 800 rows and 4 variables:

**schid** School ID (integer, 1-20)

**SES** Standardized socioeconomic status (numeric)

**gender** Factor with levels `Female`, `Male`

**math** Continuous math score (approx. mean 500, SD $\approx$ 14)

## Examples

```
data(ECLS_demo)
str(ECLS_demo)
```

save_apa *Save a ggplot figure with APA-friendly defaults*

## Description

A thin wrapper around `ggplot2::ggsave()` that applies dimensions and resolution appropriate for American Psychological Association (APA) journal submissions (6.5 in wide, 4.5 in tall, 300 dpi, white background).

## Usage

```
save_apa(filename, plot, width = 6.5, height = 4.5, dpi = 300)

apa_plot_descriptives(data, y, group, show_points = FALSE)
```

## Arguments

| | |
|---|---|
| `filename` | Path to the output file. The file extension determines the format (e.g., `".png"`, `".pdf"`, `".tiff"`). |
| `plot` | A `ggplot` object to save. |
| `width` | Width in inches (default 6.5). |
| `height` | Height in inches (default 4.5). |
| `dpi` | Resolution in dots per inch (default 300). |
| `data` | A data frame (`apa_plot_descriptives` only). |
| `y` | Character: name of the numeric outcome variable (`apa_plot_descriptives` only). |
| `group` | Character: name of the grouping factor (`apa_plot_descriptives` only). |
| `show_points` | Logical; overlay jittered points, default `FALSE` (`apa_plot_descriptives` only). |

## Value

No return value; called for its side effect of writing the plot to disk via `ggplot2::ggsave()`.

## Examples

```
library(ggplot2)
p   <- ggplot(mtcars, aes(wt, mpg)) + geom_point()
tmp <- tempfile(fileext = ".png")
save_apa(tmp, p)
file.remove(tmp)
```

## set_apa_style *Set global defaults for statAPA table styling*

### Description

Controls the default visual style applied to flextable output produced by `apa_to_flextable()` and related functions throughout the session.

### Usage

```
set_apa_style(
  style = c("auto", "decked", "plain", "none"),
  note_default = TRUE
)
```

### Arguments

| | |
|---|---|
| `style` | Character, one of `"auto"`, `"decked"`, `"plain"`, or `"none"`. `"auto"` (default) detects whether column names follow a `<group>_<stat>` pattern and adds a spanner header automatically. `"decked"` forces spanner headers. `"plain"` suppresses spanners. `"none"` removes all borders. |
| `note_default` | Logical; if `TRUE` (default) a generic APA note is appended when the calling function has not supplied one. |

### Value

Invisibly returns the previous option values (a named list), making the function suitable for use with `on.exit()` to restore settings. Called primarily for its side effect of setting `options()`.

### Examples

```
old <- set_apa_style(style = "plain", note_default = FALSE)
# restore when done
options(old)
```

## theme_apa *APA-style ggplot2 theme*

### Description

A clean, minimal theme suitable for American Psychological Association (APA) style figures: no panel gridlines, bold axis titles, and a centered bold plot title.

### Usage

```
theme_apa(base_size = 12)
```

## Arguments

| | |
|---|---|
| base_size | Base font size in points (default 12). |

## Value

A theme object from **ggplot2** that can be added to any ggplot with + theme_apa(). Applies no panel gridlines, bold axis titles, black axis text, and a centered bold plot title consistent with American Psychological Association (APA) figure guidelines.

## Examples

```
library(ggplot2)
ggplot(mtcars, aes(wt, mpg)) +
  geom_point() +
  theme_apa()
```

# Index