The apastats package*

Formats statistics in LaTeX according to the rules of the APA, 6th Edition

Naomi K. Muggleton†

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Abstract

This document describes and tests the apastats package [2018/02/13]. This package can be used in LaTeX to format statistical output according the the rules of the American Psychological Association. This package can be customised in several ways.

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*This file describes apastats version v1.0, last revised 2018/02/13.

†E-mail: n.muggleton@warwick.ac.uk

1 Introduction

The APA provides specific guidelines on how to report statistical output is reported in manuscripts that are submitted to its journals. The APA specifications are outlined in the *Publication Manual of the American Psychological Association*, the latest version of which is the 6th edition []. The APA manual outlines how authors should write their manuscript: writing style, displaying results, citing previous work, and so on. Candidate authors should study this and adhere to this. The CTAN repository offers several resources for authors who are required to format their work according to APA specifications. The apa6 class by Brian Beitzel implements the APA style requirements (double spacing, title page, running head, placement of tables and figures at the end of the manuscript, etc.). The apacite package implements the APA requirement relating to the way in which citations and reference list should be formatted. These tools are aides and minimise the likelihood of formatting errors. Another important part of the APA manual is how to display results. This is described over 43 pages in the current edition (pp. 125–167). These specifications are not handled by apa6, but by the apastats package. apastats does not require the apa6 class, nor is it exclusively designed for psychologists. This package is designed for any data scientist who wishes to format their statistical output in a consistent and conventional style.

1.1 Purpose of apastats

The main objective of apastats is to format statistical reports in accordance with the APA manual. However, as with many other APA-themed packages and classes, apastats offers several customisable options. The decision of whether to include an optional feature is based on: (1) whether I (NM) feel it's sufficiently beneficial to the user and / or straightforward to implement; and (2) whether I've come across the need for a particular customisable option (either personally or via recommendations). With this in mind, please contact me if you can suggest any improvements to the package.

2 Installation and package loading

As with most LaTeX packages, apastats is distributed as a `.dtx` file. As well as `apastats.dtx`, there is a `README` file, which provides a brief overview as well as installation instructions, and a user manual in the file `apastats.pdf` (which you are currently reading). Installation instructions are provided in `apastats.ins`. Note that `apastats.dtx` is the only essential file, because all other files can be generated by running the `.dtx` file. But it is customary and convenient to include all files.

apastats.sty The LaTeX statistics package. This must be placed in a directory

where TEX can find it.

The apastats.sty file is loaded by putting `\usepackage[`⟨*options*⟩`]{apacite}` anywhere between your `\documentclass` and `\begin{document}` commands, or by putting `\RequirePackage[`⟨*options*⟩`]{apacite}` in your own personal LATEX package (e.g., mystuff.sty), ensuring your personal package is loaded by your document.

3 Package options

4 The statistics commands

This section describes the commands that can be used to print

4.1 The "classic" apastats statistics commands

`\anova` The `\anova` command produces text statistics. There are four arguments: between-group degrees of freedom `{`⟨*arg1*⟩`}`, within-groups degrees of freedom `{`⟨*arg2*⟩`}`, *F*-statistic `{`⟨*arg3*⟩`}`, and *p*-value `{`⟨*arg4*⟩`}`. The command:

```
\anova{1, 27, 8.8896, 0.1147}
```

gives anova1, 27, 8.8896, 0.1147. Note that the macro removes leading zeros and trims values to two decimal places, where appropriate. `\anova*` gives the *p*-value

`\ttest` rounds the p value (see section X). The `\ttest` command produces text statistics. There are three arguments: degrees of freedom `{`⟨*arg1*⟩`}`, *F*-statistic `{`⟨*arg2*⟩`}`, and *p*-value `{`⟨*arg3*⟩`}`. The command:

5 The effect size commands

`\etasq` This package offers APA formatting for common effect sizes. The default is to
`\petasq` print effect sizes to two decimal places. The `\petasq{.074}`" command results
`\getasq` in petasq.074.

`\cramersc` By default, effect sizes round to two decimal places. For all effect size commends,
`\omegasq` using the star (*) will disable rounding. For example `\petasq*{.074}` produces
`\cohenf`
`\cohend`
`\cohenrho`

```
⟨*package⟩
```

`\statsformat` We define a formatting macro, `\statsformat`, to specify what format should be used to present statistical output. At present, there are three options: `apa` (default; 1), `exact` (2), and `psychscience` (see section **X**; 3).

```
\newcommand{\statsformat}{1}

\DeclareOption{exact}{\renewcommand{\statsformat}{2}}
\DeclareOption{psychscience}{\renewcommand{\statsformat}{3}}
\DeclareOption*{\PackageWarning{apastats}{Unknown `\CurrentOption'}}

\ProcessOptions\relax
```

`\trimleadingzero` Removes the leading zero from a value whose abs. value is < 1. The APA guidelines states:

> Do not use a zero before a decimal fraction when the statistic cannot be greater than 1 (e.g., correlations, proportions, and levels of statistical significance). (pp. 113, cite manual).

```
\RequirePackage{lineno, booktabs, amsmath, siunitx, ifthen}

\ExplSyntaxOn

\NewDocumentCommand\trimleadingzero{m}{
\fp_compare:nTF { 0 < \fp_abs:n {#1} < 1 }
  {\__trimleadingzero:n {#1}}
  {#1}
}

\cs_new_protected:Npn \__trimleadingzero:n #1 {
\seq_set_split:Nnn \l_ae_integer_decimal_parts_seq {.} {#1}
\fp_compare:nF {#1>0}
  { - }
  .\seq_item:Nn \l_ae_integer_decimal_parts_seq {2}
}
\ExplSyntaxOff
```

`\twodp` Rounds values to two decimal places.

```
\ExplSyntaxOn
\NewDocumentCommand{\twodp}{m}{%
  \num[output-decimal-marker = {.},
  round-mode = places,
  round-precision = 2,
  group-digits = false]{#1}
}
\ExplSyntaxOff
```

\anova Formats according to ANOVA strings into statistical output. The first argument (s) asks whether the user has used the optional star argument (*), \anova*.

```
\ExplSyntaxOn
\NewDocumentCommand \anova{sm}
{\IfBooleanTF{#1}
  {\anova_s:wwww #2 \q_stop}
  {\anova:wwww #2 \q_stop}
}
```

Execute the following if \anova* is requested by user: Execute the following if \statsformat equals 'apa' (default):

```
\ifthenelse{\equal{\statsformat}{1}}  % 1 = apa

%When star is present, do this (exact p-val):
  {\cs_new_protected:Npn \anova_s:wwww #1 , #2 , #3 , #4 \q_stop
    {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath{p = \twodp{#4}}}

%When star is present, do this (round p-val):
  \cs_new_protected:Npn \anova:wwww #1, #2, #3, #4 \q_stop
  {\group_begin:
  \fp_compare:nNnTF {#4} < {.001}
    {\fp_set:Nn \l_tmpa_fp {.001}}
    {\fp_compare:nNnTF {#4} < {.01}
      {\fp_set:Nn \l_tmpa_fp {.01}}
      {\fp_compare:nNnTF {#4} < {.05}
        {\fp_set:Nn \l_tmpa_fp {.05}}
        {\fp_set:Nn \l_tmpa_fp {1.0}}
      }
    }

  \fp_compare:nNnTF {#4} < {.001}
    {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p < {.001}}}
    {\fp_compare:nNnTF {#4} < {.01}
      {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p < {.01}}}
      {\fp_compare:nNnTF {#4} < {.05}
        {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p < {.05}}}
        {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p > {.05}}}
      }
    }
  \group_end:
  }}
```

Execute the following if \statsformat equals 'exact':

```
  {\ifthenelse{\equal{\statsformat}{2}}
    {\cs_new_protected:Npn \anova_s:wwww #1, #2, #3, #4 \q_stop
    {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p = \twodp{#4}}}

```

```
   \cs_new_protected:Npn \anova:wwww #1, #2, #3, #4 \q_stop
   {\group_begin:
  \fp_compare:nNnTF {#4} < {.001}
    {\fp_set:Nn \l_tmpa_fp {.001}}
    {\fp_compare:nNnTF {#4} < {.01}
      {\fp_set:Nn \l_tmpa_fp {.01}}
       {\fp_compare:nNnTF {#4} < {.05}
         {\fp_set:Nn \l_tmpa_fp {.05}}
         {\fp_set:Nn \l_tmpa_fp {1.0}}
       }
     }

  \fp_compare:nNnTF {#4} < {.001}
     {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p < {.001}}}
     {\fp_compare:nNnTF {#4} < {.999}
       {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p = \trimleadingzero{#4}}}
       {\ensuremath { F(#1, #2) = \twodp{#3}}, \ \ensuremath {p > .999}}
     }
   \group_end:
   }}
 }

 {\cs_new_protected:Npn \anova_s:wwww #1, #2, #3, #4 \q_stop
 {\ensuremath {F(#1, #2) = \twodp{#3} }, \ \ensuremath { p = \trimleadingzero{#4}}}

 \cs_new_protected:Npn \anova:wwww #1, #2, #3, #4 \q_stop
 {\group_begin:
 \fp_compare:nNnTF {#4} < {.001}
   {\fp_set:Nn \l_tmpa_fp {.001}}
   {\fp_compare:nNnTF {#4} < {.01}
     {\fp_set:Nn \l_tmpa_fp {.01}}
     {\fp_compare:nNnTF {#4} < {.05}
       {\fp_set:Nn \l_tmpa_fp {.05}}
       {\fp_set:Nn \l_tmpa_fp {1.0}}
     }
   }

 \fp_compare:nNnTF {#4} < {.001}
    {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p < {.001}}}
   {\fp_compare:nNnTF {#4} < {.250}
     {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p = \trimleadingzero{#4}}}
     {\ensuremath {F(#1, #2) = \twodp{#3}}, \ \ensuremath {p > {.250}}}
   }
 \group_end:
  }}

\ExplSyntaxOff
```

\ttest

```
\ExplSyntaxOn
\NewDocumentCommand \ttest{sm}{
 \IfBooleanTF{#1}
  {\ttest_s:wwww #2 \q_stop}
  {\ttest:wwww #2 \q_stop }
}

\cs_new_protected:Npn \ttest_s:wwww #1, #2, #3 \q_stop
{\ensuremath {t(#1) = \twodp{#2}}, \ \ensuremath {p = \twodp{#3}}}

\cs_new_protected:Npn \ttest:wwww #1, #2, #3 \q_stop
{\group_begin:
\fp_compare:nNnTF {#3} < {.001}
  {\fp_set:Nn \l_tmpa_fp {.001}}
  {\fp_compare:nNnTF {#3} < {.01}
    {\fp_set:Nn \l_tmpa_fp {.01}}
    {\fp_compare:nNnTF {#3} < {.05}
      {\fp_set:Nn \l_tmpa_fp {.05}}
      {\fp_set:Nn \l_tmpa_fp {1.0}}
    }
  }

\fp_compare:nNnTF {#3} < {.001}
  {\ensuremath {t(\twodp{#1}) = \twodp{#2}}, \ \ensuremath {p < {.001}}}
  {\fp_compare:nNnTF {#3} < {.01}
    {\ensuremath {t(\twodp{#1}) = \twodp{#2}}, \ \ensuremath {p < {.01}}}
    {\fp_compare:nNnTF {#3} < {.05}
      {\ensuremath {t(\twodp{#1}) = \twodp{#2}}, \ \ensuremath {p < {.05}}}
      {\ensuremath {t(\twodp{#1}) = \twodp{#2}}, \ \ensuremath {p > {.05}}}
    }
  }
\group_end:
}
\ExplSyntaxOff
```

`\etasq` Formats according to APA guidelines.

```
\ExplSyntaxOn
\NewDocumentCommand \etasq {sm}
{\IfBooleanTF{#1}
{\ensuremath {\eta^{2} = #2}}
{\ensuremath {\eta^{2} = \twodp{#2}}}
}
\ExplSyntaxOff
```

`\petasq` Formats according to APA guidelines.

```
\ExplSyntaxOn
\NewDocumentCommand \petasq {sm}
{
```

```
\IfBooleanTF{#1}
{ \ensuremath {\eta\sb{p}^{2} = #2}}
{ \ensuremath {\eta\sb{p}^{2} = \twodp{#2}}}
}
\ExplSyntaxOff
```

`\getasq` Formats according to APA guidelines.

```
\ExplSyntaxOn
\NewDocumentCommand \getasq {sm}
{
\IfBooleanTF{#1}
{ \ensuremath {\eta\sb{g}^{2} = #2}}
{ \ensuremath {\eta\sb{g}^{2} = \twodp{#2}}}
}
\ExplSyntaxOff
```

`\bayes` Formats according to APA guidelines.

```
\newcommand{\bayesten}[1]{$\text{BF}_{10} = {#1}$}
\newcommand{\bayesone}[1]{$\text{BF}_{01} = {#1}$}
```

`\chisq` Formats according to APA guidelines.

```
\newcommand{\chisq}[4]{$\chi^{2}({#1}$, $N = {#2}) = {#3}$, $p = {#4}$}
```

⟨/package⟩