

# Package ‘MLMusingR’

January 20, 2025

**Type** Package

**Title** Practical Multilevel Modeling

**Version** 0.4.0

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**Maintainer** Francis Huang <flhuang2000@yahoo.com>

**Description** Convenience functions and datasets to be used with Practical Multilevel Modeling using R. The package includes functions for calculating group means, group mean centered variables, and displaying some basic missing data information. A function for computing robust standard errors for linear mixed models based on Liang and Zeger (1986) <[doi:10.1093/biomet/73.1.13](https://doi.org/10.1093/biomet/73.1.13)> and Bell and 'McCaffrey' (2002) <<https://www150.statcan.gc.ca/n1/en/pub/12-001-x/2002002/article/9058-eng.pdf?st=NxMjN1YZ>> is included as well as a function for checking for level-one homoskedasticity (Raudenbush & Bryk, 2002, ISBN:076191904X).

**License** GPL-2

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.2

**URL** <https://github.com/flh3/MLMusingR>

**BugReports** <https://github.com/flh3/MLMusingR/issues>

**Depends** R (>= 3.5)

**Imports** lme4, stats, nlme, Matrix, methods, magrittr, broom, generics, dplyr, performance, tibble, WeMix

**NeedsCompilation** no

**Author** Francis Huang [aut, cre]

**Repository** CRAN

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cdata.ex

*Clustered dataset for centering example*

---

### Description

Dataset of 60 observations from 3 clusters.

### Usage

cdata.ex

**Format**

A wide data frame of 60 observations. Used for discussing within and between group effects.

**x** The predictor.

**y** The outcome of interest.

---

|        |                                                    |
|--------|----------------------------------------------------|
| engage | <i>Student engagement dataset (complete data).</i> |
|--------|----------------------------------------------------|

---

**Description**

Example data used to investigate missing data (this is the complete dataset).

**Usage**

`data(engage)`

**Format**

A data frame with 528 observations from 40 groups and 7 variables:

**eng** Student engagement.

**mot** Student motivation.

**gpa** Student grade point average.

**grade** Student grade level (6-8; a factor).

**rural** School level rural variable indicator; 1 = yes/0 = no.

**frpm** Percent of students eligible for free or reduced price meals at the school.

**school** School indicator (clustering variable).

---

|             |                                                        |
|-------------|--------------------------------------------------------|
| engage.miss | <i>Student engagement dataset (with missing data).</i> |
|-------------|--------------------------------------------------------|

---

**Description**

Example data used to investigate missing data (this has missing data).

**Usage**

`data(engage.miss)`

**Format**

A data frame with 528 observations from 40 groups and 7 variables:

**eng** Student engagement.

**mot** Student motivation.

**gpa** Student grade point average.

**grade** Student grade level (6-8; a factor).

**rural** School level rural variable indicator; 1 = yes/0 = no.

**frpm** Percent of students eligible for free or reduced price meals at the school.

**school** School indicator (clustering variable).

---

glance.CR2

*Glance at goodness-of-fit statistics*

---

**Description**

Helper function used to obtain supporting fit statistics for multilevel models. The R2s are computed using the ‘performance’ package.

**Usage**

```
## S3 method for class 'CR2'
glance(x, ...)
```

**Arguments**

|     |                                                |
|-----|------------------------------------------------|
| x   | A ‘CR2’ object.                                |
| ... | Unused, included for generic consistency only. |

**Value**

glance returns one row with the columns:

|                |                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------|
| nobs           | the number of observations                                                                      |
| sigma          | the square root of the estimated residual variance                                              |
| logLik         | the data’s log-likelihood under the model                                                       |
| AIC            | Akaike Information Criterion                                                                    |
| BIC            | Bayesian Information Criterion                                                                  |
| r2.marginal    | marginal R2 based on fixed effects only using method of Nakagawa and Schielzeth (2013)          |
| r2.conditional | conditional R2 based on fixed and random effects using method of Nakagawa and Schielzeth (2013) |

---

|              |                                     |
|--------------|-------------------------------------|
| group_center | <i>Group-mean center a variable</i> |
|--------------|-------------------------------------|

---

**Description**

Also referred to as centering within cluster (or within context) or demeaning the variable. By default, uses `na.rm = TRUE` when computing group means.

**Usage**

```
group_center(x, grp)
```

**Arguments**

|     |                                                                     |
|-----|---------------------------------------------------------------------|
| x   | Variable to center (e.g., <code>dataframe\$varname</code> ).        |
| grp | Cluster/grouping variable (e.g., <code>dataframe\$cluster</code> ). |

**Value**

A vector of group-mean centered variables.

**Examples**

```
data(mtcars)
#create a group centered variable
mtcars$mpg.gpc <- group_center(mtcars$mpg, mtcars$cyl)
```

---

|            |                                              |
|------------|----------------------------------------------|
| group_mean | <i>Computes the group mean of a variable</i> |
|------------|----------------------------------------------|

---

**Description**

Computes the group means of a variable by a specified cluster/group. Can also be used with factors that have two levels.

**Usage**

```
group_mean(x, grp, lm = FALSE)
```

**Arguments**

|     |                                                                            |
|-----|----------------------------------------------------------------------------|
| x   | Variable to compute the mean for (e.g., <code>dataframe\$varname</code> ). |
| grp | Cluster/grouping variable (e.g., <code>dataframe\$cluster</code> ).        |
| lm  | Compute reliability (lambda) adjusted means.                               |

**Value**

Outputs a vector of group means.

**Examples**

```
data(mtcars)
#create a group mean aggregated variable
mtcars$mpg.barj <- group_mean(mtcars$mpg, mtcars$cyl)
```

---

hdp

*Hospital, doctor, patient (hdp) dataset*


---

**Description**

This dataset has a three-level, hierarchical structure with patients nested within doctors within hospitals. The simulation code can be found at <<https://stats.idre.ucla.edu/r/codefragments/mesimulation/#setup>>.

**Usage**

```
data(hdp)
```

**Format**

A data frame with 8,525 rows and 17 variables:

**Age** Continuous in years but recorded at a higher degree of accuracy.

**Married** Binary, married/living with partner or single.

**FamilyHx** Binary (yes/no), does the patient have a family history (Hx) of cancer?

**SmokingHx** Categorical with three levels, current smoker, former smoker, never smoked.

**Sex** Binary (female/male).

**CancerStage** Categorical with four levels, stages 1-4.

**LengthofStay** Count number of days patients stayed in the hospital after surgery.

**WBC** Continuous, white blood count. Roughly 3,000 is low, 10,000 is middle, and 30,000 per microliter is high.

**RBC** Continuous, red blood count.

**BMI** Body mass index given by the formula ( $kg/meters^2$ ).

**IL6** Continuous, interleukin 6, a proinflammatory cytokine commonly examined as an indicator of inflammation, cannot be lower than zero.

**CRP** Continuous, C-reactive protein, a protein in the blood also used as an indicator of inflammation. It is also impacted by BMI.

**HID** Hospital identifier.

**DID** Doctor identifier

**Experience** Years as a doctor.

**School** Whether the school doctor trained at was high quality or not.

**remission** Cancer in remission? 1 = yes, 0 = no.

**Source**

<https://stats.oarc.ucla.edu/r/codefragments/mesimulation/>

---

Htest

*Test for homoskedasticity at level one*

---

**Description**

Based on Raudenbush and Bryk (2002) and Hoffman (2007). A statistically significant Chisq indicates heteroskedasticity. Output shows the H statistic, degrees of freedom, and p value.

**Usage**

```
Htest(newdata, fml, group)
```

**Arguments**

|         |                                |
|---------|--------------------------------|
| newdata | data to be used.               |
| fml     | level 1 formula.               |
| group   | grouping variable (in quotes). |

**Value**

Returns a data frame which contains:

|    |                                                              |
|----|--------------------------------------------------------------|
| H  | The computed H statistic.                                    |
| df | The degrees of freedom.                                      |
| p  | The p-value (< .05 indicates heteroskedasticity is present). |

**References**

Hoffman, L. (2007). *Multilevel models for examining individual differences in within-person variation and covariation over time*. *Multivariate Behavioral Research*, 42(4), 609–629. Raudenbush, S., & Bryk, A. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Sage.

**Examples**

```
set.seed(123)
x1 <- rnorm(400)
y <- x1 * .3 + rnorm(400)
gr <- rep(1:20, each = 20)
dat <- data.frame(x1, y, gr)
Htest(dat, y ~ x1, 'gr') #no violation
y <- x1 * .3 + rnorm(400, 0, sqrt(x1^2)) #add violation
dat <- data.frame(x1, y, gr)
Htest(dat, y ~ x1, 'gr')
```

**Description**

Compares two nested models (a full and a reduced model). Results in an F statistic (not the traditional chi-square) with a p-value (see Huang, 2024). The full model must come first. Statistically significant results indicate that the full model fits better than the reduced model. Uses computations shown by Li et al. (1991).

**Usage**

```
lrtPV(mf, mr)
```

**Arguments**

|    |                                           |
|----|-------------------------------------------|
| mf | The full model object fit using mixPV.    |
| mr | The reduced model object fit using mixPV. |

**References**

Huang, F. (2024). Using plausible values when fitting multilevel models with large-scale assessment data using R. *Large-scale Assessments in Education*, 12(7). ([link](#))

Li, K. H., Meng, X.L., Raghunathan, T. E., & Rubin, D. B. (1991). Significance levels from repeated p-values with multiply imputed data. *Statistica Sinica*, 65–92.

**Examples**

```
## Not run:
data(pisa2012, package = 'MLMusingR')
reduced <- mixPV(pv1math + pv2math + pv3math + pv4math + pv5math ~
  escs + (1|schoolid), data = pisa2012,
  weights = c('w_fstuwt', 'w_fschtwt'))
full <- mixPV(pv1math + pv2math + pv3math + pv4math + pv5math ~
  escs + (escs|schoolid), data = pisa2012,
  weights = c('w_fstuwt', 'w_fschtwt'))
lrtPV(full, reduced)

## End(Not run)
```



---

|                |                                                    |
|----------------|----------------------------------------------------|
| MatSqrtInverse | <i>Compute the inverse square root of a matrix</i> |
|----------------|----------------------------------------------------|

---

**Description**

From Imbens and Kolesar (2016).

**Usage**

```
MatSqrtInverse(A)
```

**Arguments**

|   |                    |
|---|--------------------|
| A | The matrix object. |
|---|--------------------|

---

|       |                                                              |
|-------|--------------------------------------------------------------|
| mixPV | <i>Fit Weighted Multilevel Models Using Plausible Values</i> |
|-------|--------------------------------------------------------------|

---

**Description**

Helper function to fit multilevel models with plausible values using weights at different levels using the mix function from the WeMix package (Bailey et al., 2023): see <https://cran.r-project.org/web/packages/WeMix/WeMix.p>

**Usage**

```
mixPV(fm1, data = NULL, mc = FALSE, silent = FALSE, ...)
```

**Arguments**

|        |                                                                                                                                                      |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| fm1    | The model formula. Multiple plausible values are specified using the form: $p_{v1} + p_{v2} + p_{v3} \sim x_1$ (depending how many PVs are present). |
| data   | Merged dataset to analyze (containing variables at different levels).                                                                                |
| mc     | Option to use multiple cores to speed up processing (set to FALSE by default).                                                                       |
| silent | Option to show which plausible value is being analyzed (set to FALSE by default).                                                                    |
| ...    | Options that are used by the mix function in the WeMix package.                                                                                      |

**Value**

A list object of mix results. Results are pooled using the summary function.

**Author(s)**

Francis Huang, <huangf@missouri.edu>

## References

Huang, F. (2024). Using plausible values when fitting multilevel models with large-scale assessment data using R. *Large-scale Assessments in Education*, 12(7). ([link](#))

## Examples

```
## Not run:
data(pisa2012, package = 'MLMusingR')
m1 <- mixPV(pv1math + pv2math + pv3math + pv4math + pv5math ~ escs + (1|schoolid),
weights = c('wfstwt', 'wfscht'), data = pisa2012)
summary(m1)

## End(Not run)
```

---

|       |                                            |
|-------|--------------------------------------------|
| nmiss | <i>Amount of missing data per variable</i> |
|-------|--------------------------------------------|

---

## Description

Amount of missing data per variable

## Usage

```
nmiss(dat)
```

## Arguments

dat                    Data frame that you want to inspect.

## Value

By default, this function will print the following items to the console

- The percent of missing data per variable.
- The percent of complete cases (range: 0 to 1).
- Suggested number of datasets to impute when using multiple imputation.

## Examples

```
data(mtcars)
mtcars[c(2:3), 4] <- NA #create NAs
nmiss(mtcars)
```

---

pisa2012

*USA data from PISA 2012*

---

### Description

Example data for mixPV.

### Usage

```
data(pisa2012)
```

### Format

A data frame with 3136 rows and 14 variables:

**pv1math** Plausible value #1 for mathematics

**pv2math** Plausible value #2 for mathematics

**pv3math** Plausible value #3 for mathematics

**pv4math** Plausible value #4 for mathematics

**pv5math** Plausible value #5 for mathematics

**escs** Index of economic, social, and cultural status.

**schoolid** School identifier

**st29q03** Maths interest- Look forward to lessons.

**st04q01** Student gender.

**w\_fstuwt** Final student weight (total).

**w\_fschwt** School weight.

**sc14q02** Shortage- Maths teachers

**pwt1** Student weight (conditional).

**noise1** Random noise.

### Source

<https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014028>

---

pool\_pv *Pool plausible values using Rubin's rules*

---

**Description**

Pool plausible values using Rubin's rules

**Usage**

```
pool_pv(Bs, SEs, ns2, dfadj = TRUE)
```

**Arguments**

|       |                                                                                                     |
|-------|-----------------------------------------------------------------------------------------------------|
| Bs    | The regression coefficients.                                                                        |
| SEs   | The standard errors.                                                                                |
| ns2   | The number of observations.                                                                         |
| dfadj | If set to TRUE (default), uses newer df computation. If FALSE, uses standard Rubin pooling formula. |

---

ri\_test1 *Sample dataset 1 for testing the likelihood ratio test*

---

**Description**

Example data for testing the need for a random intercept. Illustrates the need to adjust the p values for a modified LRT.

**Usage**

```
data(ri_test1)
```

**Format**

A data frame with 900 observations from 30 groups and 4 variables:

**y** The outcome variable.  
**w1** A level-2 predictor.  
**x1** A level-1 predictor  
**group** The cluster identifier

---

|          |                                                                     |
|----------|---------------------------------------------------------------------|
| ri_test2 | <i>Sample dataset 2 for testing the likelihood ratio test (LRT)</i> |
|----------|---------------------------------------------------------------------|

---

**Description**

Example data for testing the need for a random intercept. LRT results show that a random slope is not warranted.

**Usage**

```
data(ri_test2)
```

**Format**

A data frame with 3,000 observations from 30 groups and 4 variables:

**y** The outcome variable.

**w1** A level-2 predictor.

**x1** A level-1 predictor

**group** The cluster identifier

---

|              |                                                                                                   |
|--------------|---------------------------------------------------------------------------------------------------|
| robust_mixed | <i>Cluster robust standard errors with degrees of freedom adjustments for lmerMod/lme objects</i> |
|--------------|---------------------------------------------------------------------------------------------------|

---

**Description**

Function to compute the CR2/CR0 cluster robust standard errors (SE) with Bell and McCaffrey (2002) degrees of freedom (dof) adjustments. Suitable even with a low number of clusters. The model based (mb) and cluster robust standard errors are shown for comparison purposes.

**Usage**

```
robust_mixed(m1, digits = 3, type = "CR2", satt = TRUE, Gname = NULL)
```

**Arguments**

|        |                                                                                              |
|--------|----------------------------------------------------------------------------------------------|
| m1     | The lmerMod or lme model object.                                                             |
| digits | Number of decimal places to display.                                                         |
| type   | Type of cluster robust standard error to use ("CR2" or "CR0").                               |
| satt   | If Satterthwaite degrees of freedom are to be computed (if not, between-within df are used). |
| Gname  | Group/cluster name if more than two levels of clustering (does not work with lme).           |

**Value**

A data frame (results) with the cluster robust adjustments with p-values.

|          |                                                      |
|----------|------------------------------------------------------|
| Estimate | The regression coefficient.                          |
| mb.se    | The model-based (regular, unadjusted) SE.            |
| cr.se    | The cluster robust standard error.                   |
| df       | degrees of freedom: Satterthwaite or between-within. |
| p.val    | p-value using CR0/CR2 standard error.                |
| stars    | stars showing statistical significance.              |

**Author(s)**

Francis Huang, <huangf@missouri.edu>

Bixi Zhang, <bixizhang@missouri.edu>

**References**

Bell, R., & McCaffrey, D. (2002). *Bias reduction in standard errors for linear regression with multi-stage samples*. *Survey Methodology*, 28, 169-182. ([link](#))

Liang, K.Y., & Zeger, S. L. (1986). *Longitudinal data analysis using generalized linear models*. *Biometrika*, 73(1), 13-22. ([doi:10.1093/biomet/73.1.13](https://doi.org/10.1093/biomet/73.1.13))

**Examples**

```
require(lme4)
data(sch29, package = 'MLMusingR')
robust_mixed(lmer(math ~ male + minority + mses + mhmwk + (1|schid), data = sch29))
```

---

satdf

*Compute Satterthwaite degrees of freedom*

---

**Description**

Function to compute empirical degrees of freedom based on Bell and McCaffrey (2002).

**Usage**

```
satdf(m1, type = "none", Vinv2, Vm2, br2, Gname = NULL)
```

**Arguments**

|       |                                                                 |
|-------|-----------------------------------------------------------------|
| m1    | The lmerMod or lme model object.                                |
| type  | The type of cluster robust correction used (i.e., CR2 or none). |
| Vinv2 | Inverse of the variance matrix.                                 |
| Vm2   | The variance matrix.                                            |
| br2   | The bread component.                                            |
| Gname | The group (clustering variable) name'                           |

**Author(s)**

Francis Huang, <huangf@missouri.edu>

Bixi Zhang, <bixizhang@missouri.edu>

---

sch29

*Data from 29 schools (based on the NELS dataset) used for regression diagnostics*

---

**Description**

For examining the association between amount homework done per week and math outcome.

**Usage**

```
data(sch29)
```

**Format**

A data frame with 648 rows and 8 variables:

**schid** The school identifier (the grouping variable)

**ses** Student-level socioeconomic status

**byhomework** Total amount of time the student spent on homework per week. 1 = None, 2 = Less than one hour, 3 = 1 hour, 4 = 2 hours, 5 = 3 hours, 6 = 4-6 hours, 7 = 7 - 9 hours, 8 = 10 or more

**math** Mathematics score.

**male** Dummy coded gender, 1 = male, 0 = female

**minority** Dummy coded minority status, 1 = yes, 0 = no

**mses** Aggregated socioeconomic status at the school level

**mhmwk** Aggregated time spent on homework at the school level

**Source**

<https://nces.ed.gov/pubs92/92030.pdf>

---

|               |                                                      |
|---------------|------------------------------------------------------|
| summary.mixPV | <i>Create summary output from the mixPV function</i> |
|---------------|------------------------------------------------------|

---

**Description**

Create summary output from the mixPV function

**Usage**

```
## S3 method for class 'mixPV'  
summary(object, dfadj = TRUE, ...)
```

**Arguments**

|        |                                                                                                     |
|--------|-----------------------------------------------------------------------------------------------------|
| object | The mixPV object                                                                                    |
| dfadj  | If set to TRUE (default), uses newer df computation. If FALSE, uses standard Rubin pooling formula. |
| ...    | Additional unspecified options.                                                                     |

---

|             |                                                                  |
|-------------|------------------------------------------------------------------|
| summary_all | <i>Use the summary function on a saved list of mixPV results</i> |
|-------------|------------------------------------------------------------------|

---

**Description**

Use the summary function on a saved list of mixPV results

**Usage**

```
summary_all(x)
```

**Arguments**

|   |                   |
|---|-------------------|
| x | The mixPV object. |
|---|-------------------|



---

suspend                      *Suspension data from Virginia*

---

**Description**

Data from 8465 students from 100 schools in Virginia

**Usage**

data(suspend)

**Format**

Dataset:

**school** School identifier

**pminor** Percent minority enrollment at school

**male** 1 = male, 0 = female

**sus** Whether the student was suspended (1 = yes) in the school year or not (0 = no). Self reported.

**fight** If the student got into one or more fights (1 = yes) in the school year

**gpa** Students self-reported GPA; 1 = D to 4 = A

---

thai                              *Thai data from PISA*

---

**Description**

Example data to be used for centering

**Usage**

data(thai)

**Format**

A data frame with 6606 rows and 18 variables:

**pv1math** First plausible value in mathematics.

**escs** Index of economic, social, and cultural status.

**hisei** Highest parent occupational status.

**sex** Student gender. 1 = Female, 2 = Male.

**intmat** Mathematics interest.

**matheff** Mathematics self-efficacy.

**schoolid** School identifier  
**othl** Spoke another language at home other than Thai. 1 = yes, 0 = no.  
**books** How many books at home.  
**pared** Highest parental education in years.  
**w\_fstuwt** Student weight.  
**pv1read** Plausible value #1 for reading.  
**pv2read** Plausible value #2 for reading.  
**pv3read** Plausible value #3 for reading.  
**pv4read** Plausible value #4 for reading.  
**pv5read** Plausible value #5 for reading.  
**private** Private school. 1 = yes, 0 = no.  
**schsize** Total school enrolment.

### Source

<https://gpseducation.oecd.org/CountryProfile?primaryCountry=THA>

---

thai.sm

*Thai data from PISA (reduced)*

---

### Description

Example data to be used for centering

### Usage

`data(thai)`

### Format

A data frame with 4271 rows and 7 variables:

**math** First plausible value in mathematics.  
**escs** Index of economic, social, and cultural status.  
**intmat** Mathematics interest.  
**schoolid** School identifier  
**othl** Spoke another language at home other than Thai. 1 = yes, 0 = no.  
**private** Private school. 1 = yes, 0 = no.  
**schsize** Total school enrolment.

### Source

<https://gpseducation.oecd.org/CountryProfile?primaryCountry=THA>

---

|          |                          |
|----------|--------------------------|
| tidy.CR2 | <i>Tidy a CR2 object</i> |
|----------|--------------------------|

---

**Description**

Tidy a CR2 object

**Usage**

```
## S3 method for class 'CR2'
tidy(x, conf.int = FALSE, conf.level = 0.95, ...)
```

**Arguments**

|            |                                                                                                                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A 'CR2' object.                                                                                                                                                                                       |
| conf.int   | Logical indicating whether or not to include a confidence interval in the tidied output. Defaults to FALSE.                                                                                           |
| conf.level | The confidence level to use for the confidence interval if conf.int = TRUE. Must be strictly greater than 0 and less than 1. Defaults to 0.95, which corresponds to a 95 percent confidence interval. |
| ...        | Unused, included for generic consistency only.                                                                                                                                                        |

**Value**

A tidy [tibble::tibble()] summarizing component-level information about the model

---

|            |                                                       |
|------------|-------------------------------------------------------|
| tidy.mixPV | <i>Helper function to allow use with modelsummary</i> |
|------------|-------------------------------------------------------|

---

**Description**

Helper function to allow use with modelsummary

**Usage**

```
## S3 method for class 'mixPV'
tidy(x, dfadj = TRUE, ...)
```

**Arguments**

|       |                                                                                                     |
|-------|-----------------------------------------------------------------------------------------------------|
| x     | The mixPV model object.                                                                             |
| dfadj | If set to TRUE (default), uses newer df computation. If FALSE, uses standard Rubin pooling formula. |
| ...   | Additional unspecified options.                                                                     |

---

|      |                                                    |
|------|----------------------------------------------------|
| wide | <i>Wide dataset to be used for growth modeling</i> |
|------|----------------------------------------------------|

---

**Description**

A dataset containing 30 observations with reading scores taken in the fall kindergarten, spring kindergarten, and spring first grade

**Usage**

wide

**Format**

A wide data frame of 30 observations:

**studentid** Factor indicating student identification

**int** treatment or control

**female** 1 = female, 0 = male

**fall\_k** Reading scores in fall kindergarten

**spring\_k** Reading scores in spring kindergarten

**spring\_g1** Reading scores in spring first grade

---

|        |                                  |
|--------|----------------------------------|
| wscale | <i>Scale of Sampling Weights</i> |
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**Description**

Uses the `cluster` and `ecluster` (cluster size and effective cluster size) options specified in `Mplus`. See [note](#) from the `Mplus` website. If there is no variation in weights within a cluster, the weights will scale to 1.

**Usage**

```
wscale(cluster, data, wt, type = "cluster")
```

**Arguments**

|                      |                                                                                                 |
|----------------------|-------------------------------------------------------------------------------------------------|
| <code>cluster</code> | The cluster variable.                                                                           |
| <code>data</code>    | The original dataset.                                                                           |
| <code>wt</code>      | The weight variable to scale.                                                                   |
| <code>type</code>    | Either <code>cluster</code> or <code>ecluster</code> . See pdf from <code>Mplus</code> website. |

**Examples**

```
data(pisa2012, package = 'MLMusingR')
pisa2012$clustwt <- wscale('schoolid', pisa2012, 'w_fschwt')
```

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