R Notebook

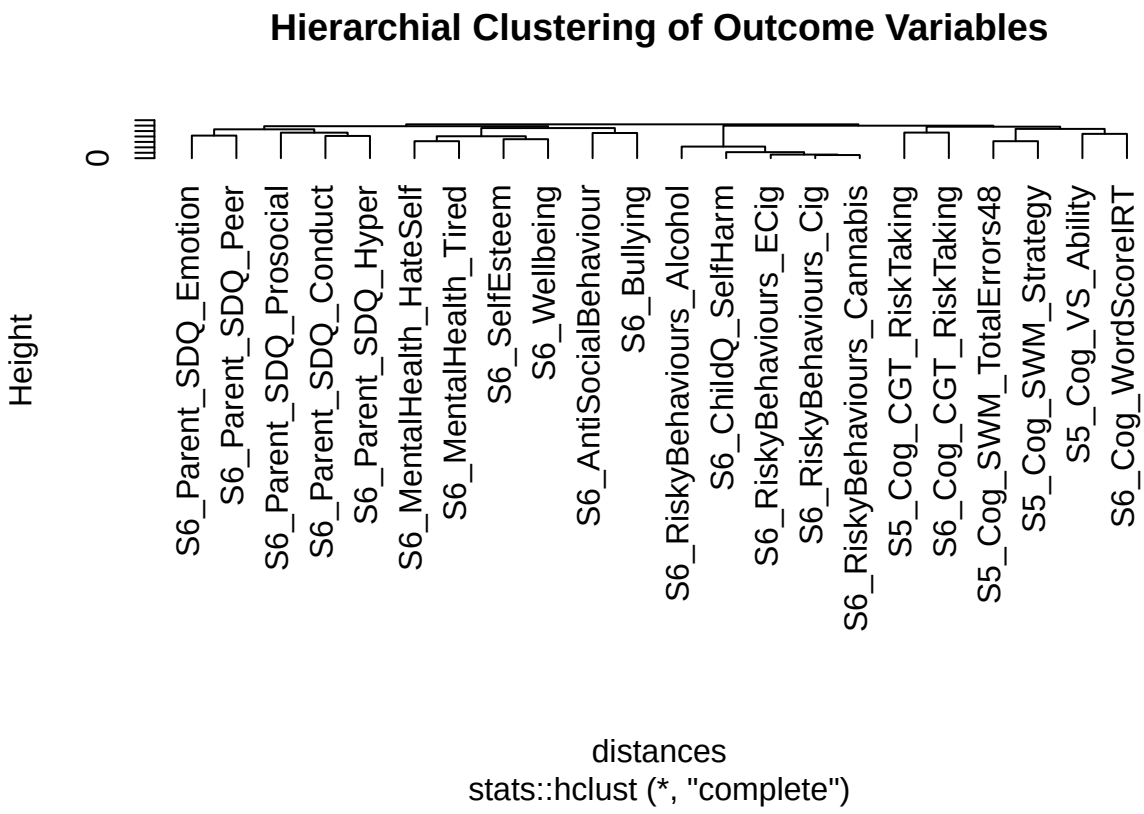
Load data

```
rm(list=ls())
source("Script P2S0 - Load Analysis Environment.R")
load(file.path("Output R Data", "cca_boot.Rdata"))
load(file.path("Output R Data", "cca_splithalf.Rdata"))
load(file.path("Output R Data", "cca_boot_teach.Rdata"))
load(file.path("Output R Data", "cca_splithalf_teacher.Rdata"))
```

Analysis 0 - Hierarchial cluster analysis of variables

To simply aid visualisation, we have cluster the predictor and outcome variables into 4 (5 groups including teacher metrics)

```
distances = stats::dist(t(df0_imputed_BothGroups[,outcomes]), method="manhattan")
  hclust_results = stats::hclust(distances)
  Outcome_Order = hclust_results$order
  Outcome_Ordered = outcomes[Outcome_Order]
  Outcome_Labels_Ordered = outcomes_labels[Outcome_Order]
  plot(hclust_results, hang=-1, main = "Hierarchial Clustering of Outcome Variables")
```




```
  Outcome_Cluster = stats::cutree(hclust_results, 4)
# sort(Outcome_Cluster)
  Outcome_Cluster_Labels = Convert(Outcome_Cluster,1:4,c("Behavioural Problems","Mental Health", "Drug-

# For ease of presentation, teacher's responses are not clustered in the usual way, but just tagged on
  Outcome_Cluster2 = c(rep(0,6),Outcome_Cluster)
  Outcome_Ordered2 = c(outcomes2[1:6],Outcome_Ordered)
  Outcome_Labels_Ordered2 = c(outcomes_labels2[1:6],Outcome_Labels_Ordered)
  names(Outcome_Cluster2)[1:6] = outcomes2[1:6]
  Outcome_Cluster_Labels2 = Convert(Outcome_Cluster2,0:4,c("Teacher Ratings","Behavioural Problems","Me

# not used in results  - but out of curiorsity looked at clustering all outcomes with teacher-reports
#
#       hclust_results = hclust(dist(t(df0_imputed_Teach[,outcomes2]), method="manhattan"))
#       plot(hclust_results, hang=-1)

#Cluster Predictors
distances = dist(t(df0_imputed_group1[,envvar]), method="manhattan")
hclust_results = hclust(distances)
envvar_Order = hclust_results$order
envvar_Ordered = envvar[envvar_Order]
envvar_Labels_Ordered = envvar_labels[envvar_Order]
# plot(hclust_results, hang=-1)
```

Plot All Outcomes

```
pdf(file=file.path("Plots","histograms_variables_combined.pdf"),height=40, width=15)
par(mfrow=c(30,5), mar=c(1,1,3,1))
for (i in c(envvar, outcomes)){
    hist(df0_imputed_BothGroups[,i], main=i, col="grey")
  }
dev.off()
```

```
## pdf
##   2
```

Figure 2

note to giacomo - fix axes!

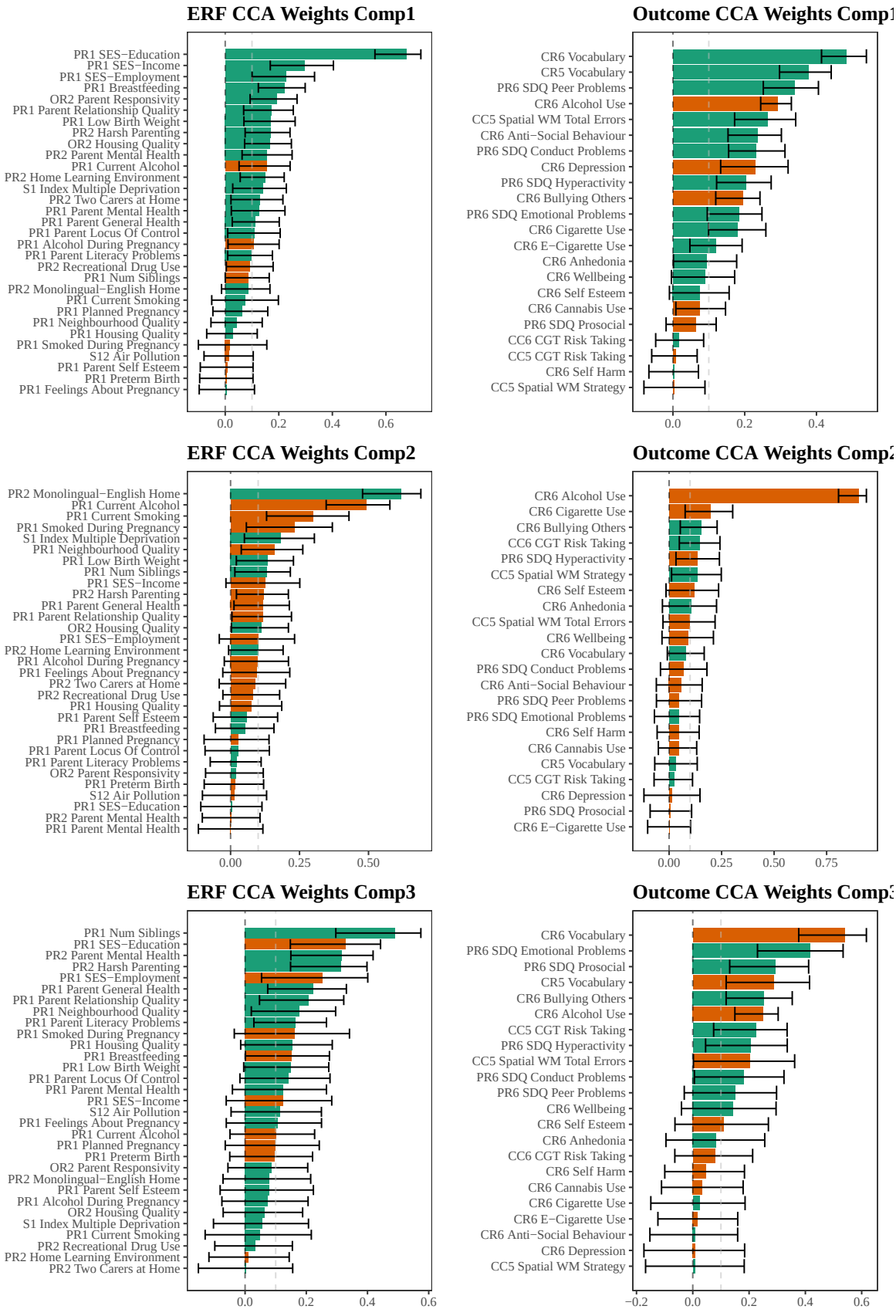
```
PlotLoadings = function(dat, recode=FALSE, titletext=""){

  if (recode){
    dat = dat*-1
  }

  dat$negative = dat$original<0
  # dat[!dat$negative,1:4]=dat[!dat$negative,1:4]*-1
  dat$FancyLabels = all_var_labels2[match(rownames(dat),all_var2)]
  # dat$Group = factor(as.numeric(grepl("S[5-6]",dat$varlabel)), labels=c("Environmental Predictors","O
  dat = dat[order(abs(dat$original)),]

  dat$errormin = dat$X2.5.
    dat$errormin[dat$negative] = dat$errormin[dat$negative]*-1
  dat$errormax = dat$X97.5
    dat$errormax[dat$negative] = dat$errormax[dat$negative]*-1


   plot=
    ggplot(dat, aes(x=1:nrow(dat), y=abs(original), fill=negative)) + geom_bar(stat="identity")  +
      geom_errorbar(aes(ymin=errormin,ymax=errormax)) +
    jtools::theme_apa() +
    coord_flip() + labs(y=NULL,x="") + theme(legend.position = "none") + scale_fill_manual(values=c( "#
    scale_x_continuous(breaks=1:nrow(dat),labels=dat$FancyLabels) +
    theme(text=element_text(family="serif")) +
     geom_hline(aes( alpha=.9, yintercept=.1), linetype="dashed", col="grey") +
    geom_hline(aes( alpha=.9, yintercept=0), linetype="dashed") +
     labs(title=titletext)

  plot
  # facet_wrap(~Group,strip.position = "top", scales = "free", nrow=1, ncol=2) + theme(panel.spacing = 
  #  scale_x_continuous(breaks=1:nrow(dat),labels=dat$FancyLabels)
  #
  return(plot)
}
```

```r
p1 = PlotLoadings(cca_boot$xcoef_Quantiles[[1]], titletext = "ERF CCA Weights Comp1")
p2 = PlotLoadings(cca_boot$xcoef_Quantiles[[2]], titletext = "ERF CCA Weights Comp2")
p3 = PlotLoadings(cca_boot$xcoef_Quantiles[[3]], titletext = "ERF CCA Weights Comp3")

p4 = PlotLoadings(cca_boot$ycoef_Quantiles[[1]], titletext = "Outcome CCA Weights Comp1")
p5 = PlotLoadings(cca_boot$ycoef_Quantiles[[2]], titletext = "Outcome CCA Weights Comp2")
p6 = PlotLoadings(cca_boot$ycoef_Quantiles[[3]], titletext = "Outcome CCA Weights Comp3")

library(patchwork)
```

```
##
## Attaching package: 'patchwork'
```

```
## The following object is masked from 'package:MASS':
##
##     area
```

```r
LoadingPlot = p1 + p2 + p3 + p4 + p5 + p6 + patchwork::plot_layout(ncol = 2, byrow = FALSE)
LoadingPlot
```


ERF CCA Weights Comp1
PR1 SES−Education
PR1 SES−Income
PR1 SES−Employment
PR1 Breastfeeding
OR2 Parent Responsivity
PR1 Parent Relationship Quality
PR1 Low Birth Weight
PR2 Harsh Parenting
OR2 Housing Quality
PR2 Parent Mental Health
PR1 Current Alcohol
PR2 Home Learning Environment
S1 Index Multiple Deprivation
PR2 Two Carers at Home
PR1 Parent Mental Health
PR1 Parent General Health
PR1 Parent Locus Of Control
PR1 Alcohol During Pregnancy
PR1 Parent Literacy Problems
PR2 Recreational Drug Use
PR1 Num Siblings
PR2 Monolingual−English Home
PR1 Current Smoking
PR1 Planned Pregnancy
PR1 Neighbourhood Quality
PR1 Housing Quality
PR1 Smoked During Pregnancy
S12 Air Pollution
PR1 Parent Self Esteem
PR1 Preterm Birth
PR1 Feelings About Pregnancy
0.0
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Outcome CCA Weights Comp1
CR6 Vocabulary
CR5 Vocabulary
PR6 SDQ Peer Problems
CR6 Alcohol Use
CC5 Spatial WM Total Errors
CR6 Anti−Social Behaviour
PR6 SDQ Conduct Problems
CR6 Depression
PR6 SDQ Hyperactivity
CR6 Bullying Others
PR6 SDQ Emotional Problems
CR6 Cigarette Use
CR6 E−Cigarette Use
CR6 Anhedonia
CR6 Wellbeing
CR6 Self Esteem
CR6 Cannabis Use
PR6 SDQ Prosocial
CC6 CGT Risk Taking
CC5 CGT Risk Taking
CR6 Self Harm
CC5 Spatial WM Strategy
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ERF CCA Weights Comp2
PR2 Monolingual−English Home
PR1 Current Alcohol
PR1 Current Smoking
PR1 Smoked During Pregnancy
S1 Index Multiple Deprivation
PR1 Neighbourhood Quality
PR1 Low Birth Weight
PR1 Num Siblings
PR1 SES−Income
PR2 Harsh Parenting
PR1 Parent General Health
PR1 Parent Relationship Quality
OR2 Housing Quality
PR1 SES−Employment
PR2 Home Learning Environment
PR1 Alcohol During Pregnancy
PR1 Feelings About Pregnancy
PR2 Two Carers at Home
PR2 Recreational Drug Use
PR1 Housing Quality
PR1 Parent Self Esteem
PR1 Breastfeeding
PR1 Planned Pregnancy
PR1 Parent Locus Of Control
PR1 Parent Literacy Problems
OR2 Parent Responsivity
PR1 Preterm Birth
S12 Air Pollution
PR1 SES−Education
PR2 Parent Mental Health
PR1 Parent Mental Health
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Outcome CCA Weights Comp2
CR6 Alcohol Use
CR6 Cigarette Use
CR6 Bullying Others
CC6 CGT Risk Taking
PR6 SDQ Hyperactivity
CC5 Spatial WM Strategy
CR6 Self Esteem
CR6 Anhedonia
CC5 Spatial WM Total Errors
CR6 Wellbeing
CR6 Vocabulary
PR6 SDQ Conduct Problems
CR6 Anti−Social Behaviour
PR6 SDQ Peer Problems
PR6 SDQ Emotional Problems
CR6 Self Harm
CR6 Cannabis Use
CR5 Vocabulary
CC5 CGT Risk Taking
CR6 Depression
PR6 SDQ Prosocial
CR6 E−Cigarette Use
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ERF CCA Weights Comp3
PR1 Num Siblings
PR1 SES−Education
PR2 Parent Mental Health
PR2 Harsh Parenting
PR1 SES−Employment
PR1 Parent General Health
PR1 Parent Relationship Quality
PR1 Neighbourhood Quality
PR1 Parent Literacy Problems
PR1 Smoked During Pregnancy
PR1 Housing Quality
PR1 Breastfeeding
PR1 Low Birth Weight
PR1 Parent Locus Of Control
PR1 Parent Mental Health
PR1 SES−Income
S12 Air Pollution
PR1 Feelings About Pregnancy
PR1 Current Alcohol
PR1 Planned Pregnancy
PR1 Preterm Birth
OR2 Parent Responsivity
PR2 Monolingual−English Home
PR1 Parent Self Esteem
PR1 Alcohol During Pregnancy
OR2 Housing Quality
S1 Index Multiple Deprivation
PR1 Current Smoking
PR2 Recreational Drug Use
PR2 Home Learning Environment
PR2 Two Carers at Home
0.0
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0.6
Outcome CCA Weights Comp3
CR6 Vocabulary
PR6 SDQ Emotional Problems
PR6 SDQ Prosocial
CR5 Vocabulary
CR6 Bullying Others
CR6 Alcohol Use
CC5 CGT Risk Taking
PR6 SDQ Hyperactivity
CC5 Spatial WM Total Errors
PR6 SDQ Conduct Problems
PR6 SDQ Peer Problems
CR6 Wellbeing
CR6 Self Esteem
CR6 Anhedonia
CC6 CGT Risk Taking
CR6 Self Harm
CR6 Cannabis Use
CR6 Cigarette Use
CR6 E−Cigarette Use
CR6 Anti−Social Behaviour
CR6 Depression
CC5 Spatial WM Strategy
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```r
ggsave(filename=file.path("Plots","LoadingsPlots_group1.pdf"),  LoadingPlot, device="pdf", width=9, hei
ggsave(filename=file.path("Plots","LoadingsPlots_group1.png"),  LoadingPlot, device="png", width=9, hei


rm(p1,p2,p3,p4,p5,p6,LoadingPlot)
```

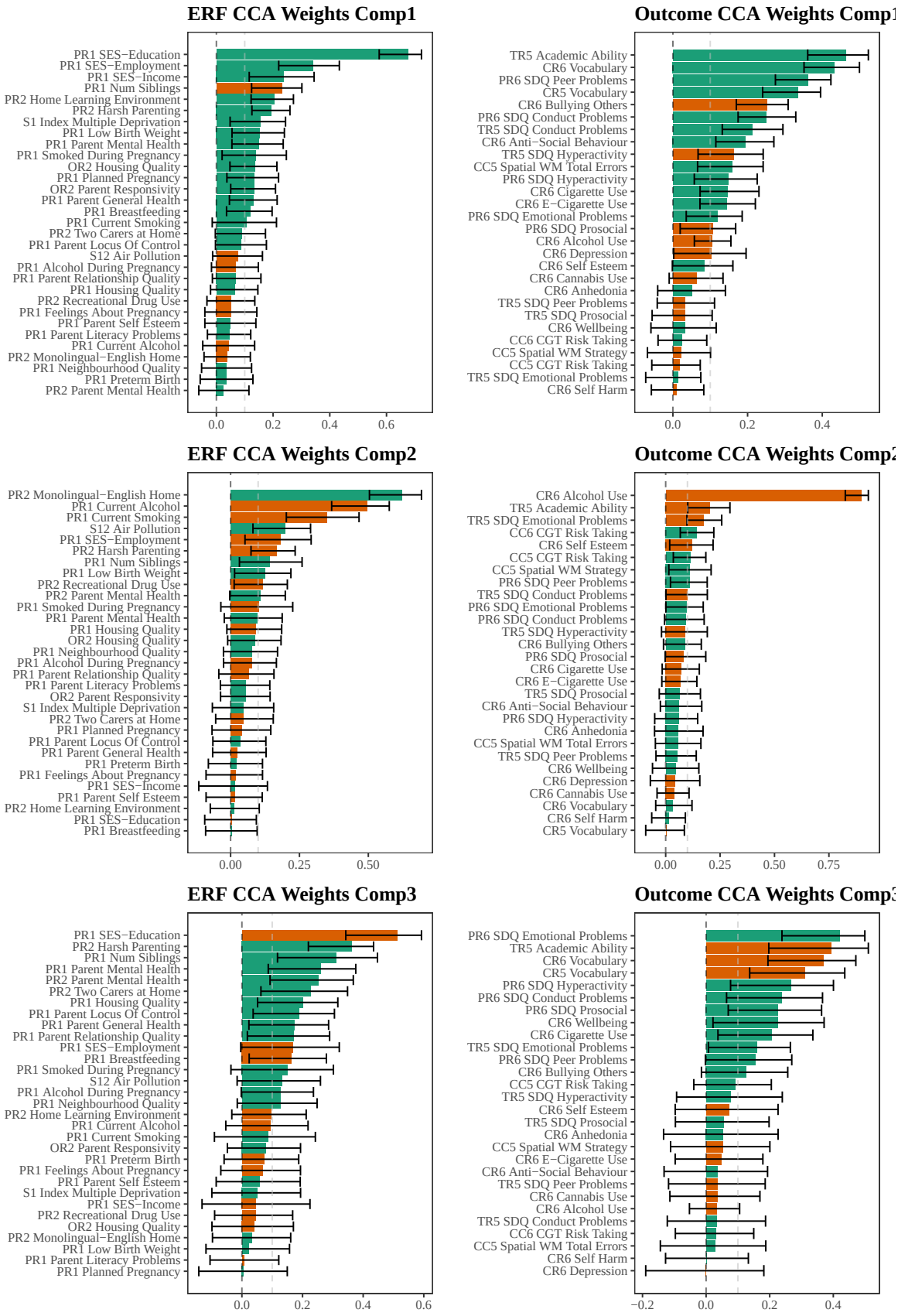
Supplementary Figure 3

```r
# cca_splithalf_procrustes$model_results

p1 = PlotLoadings(cca_boot_teach$xcoef_Quantiles[[1]], titletext = "ERF CCA Weights Comp1")
p2 = PlotLoadings(cca_boot_teach$xcoef_Quantiles[[2]], titletext = "ERF CCA Weights Comp2")
p3 = PlotLoadings(cca_boot_teach$xcoef_Quantiles[[3]], titletext = "ERF CCA Weights Comp3")

p4 = PlotLoadings(cca_boot_teach$ycoef_Quantiles[[1]], titletext = "Outcome CCA Weights Comp1")
p5 = PlotLoadings(cca_boot_teach$ycoef_Quantiles[[2]], titletext = "Outcome CCA Weights Comp2")
p6 = PlotLoadings(cca_boot_teach$ycoef_Quantiles[[3]], titletext = "Outcome CCA Weights Comp3")

library(patchwork)
LoadingPlot = p1 + p2 + p3 + p4 + p5 + p6 + patchwork::plot_layout(ncol = 2, byrow = FALSE)
LoadingPlot
```


ERF CCA Weights Comp1
PR1 SES−Education
PR1 SES−Employment
PR1 SES−Income
PR1 Num Siblings
PR2 Home Learning Environment
PR2 Harsh Parenting
S1 Index Multiple Deprivation
PR1 Low Birth Weight
PR1 Parent Mental Health
PR1 Smoked During Pregnancy
OR2 Housing Quality
PR1 Planned Pregnancy
OR2 Parent Responsivity
PR1 Parent General Health
PR1 Breastfeeding
PR1 Current Smoking
PR2 Two Carers at Home
PR1 Parent Locus Of Control
S12 Air Pollution
PR1 Alcohol During Pregnancy
PR1 Parent Relationship Quality
PR1 Housing Quality
PR2 Recreational Drug Use
PR1 Feelings About Pregnancy
PR1 Parent Self Esteem
PR1 Parent Literacy Problems
PR1 Current Alcohol
PR2 Monolingual−English Home
PR1 Neighbourhood Quality
PR1 Preterm Birth
PR2 Parent Mental Health
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Outcome CCA Weights Comp1
TR5 Academic Ability
CR6 Vocabulary
PR6 SDQ Peer Problems
CR5 Vocabulary
CR6 Bullying Others
PR6 SDQ Conduct Problems
TR5 SDQ Conduct Problems
CR6 Anti−Social Behaviour
TR5 SDQ Hyperactivity
CC5 Spatial WM Total Errors
PR6 SDQ Hyperactivity
CR6 Cigarette Use
CR6 E−Cigarette Use
PR6 SDQ Emotional Problems
PR6 SDQ Prosocial
CR6 Alcohol Use
CR6 Depression
CR6 Self Esteem
CR6 Cannabis Use
CR6 Anhedonia
TR5 SDQ Peer Problems
TR5 SDQ Prosocial
CR6 Wellbeing
CC6 CGT Risk Taking
CC5 Spatial WM Strategy
CC5 CGT Risk Taking
TR5 SDQ Emotional Problems
CR6 Self Harm
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ERF CCA Weights Comp2
PR2 Monolingual−English Home
PR1 Current Alcohol
PR1 Current Smoking
S12 Air Pollution
PR1 SES−Employment
PR2 Harsh Parenting
PR1 Num Siblings
PR1 Low Birth Weight
PR2 Recreational Drug Use
PR2 Parent Mental Health
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PR1 Parent Mental Health
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PR1 Neighbourhood Quality
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PR1 Parent Relationship Quality
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PR1 Parent General Health
PR1 Preterm Birth
PR1 Feelings About Pregnancy
PR1 SES−Income
PR1 Parent Self Esteem
PR2 Home Learning Environment
PR1 SES−Education
PR1 Breastfeeding
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Outcome CCA Weights Comp2
CR6 Alcohol Use
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TR5 SDQ Emotional Problems
CC6 CGT Risk Taking
CR6 Self Esteem
CC5 CGT Risk Taking
CC5 Spatial WM Strategy
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TR5 SDQ Hyperactivity
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PR6 SDQ Prosocial
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CR6 E−Cigarette Use
TR5 SDQ Prosocial
CR6 Anti−Social Behaviour
PR6 SDQ Hyperactivity
CR6 Anhedonia
CC5 Spatial WM Total Errors
TR5 SDQ Peer Problems
CR6 Wellbeing
CR6 Depression
CR6 Cannabis Use
CR6 Vocabulary
CR6 Self Harm
CR5 Vocabulary
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ERF CCA Weights Comp3
PR1 SES−Education
PR2 Harsh Parenting
PR1 Num Siblings
PR1 Parent Mental Health
PR2 Parent Mental Health
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PR1 SES−Employment
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PR1 SES−Income
PR2 Recreational Drug Use
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PR2 Monolingual−English Home
PR1 Low Birth Weight
PR1 Parent Literacy Problems
PR1 Planned Pregnancy
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Outcome CCA Weights Comp3
PR6 SDQ Emotional Problems
TR5 Academic Ability
CR6 Vocabulary
CR5 Vocabulary
PR6 SDQ Hyperactivity
PR6 SDQ Conduct Problems
PR6 SDQ Prosocial
CR6 Wellbeing
CR6 Cigarette Use
TR5 SDQ Emotional Problems
PR6 SDQ Peer Problems
CR6 Bullying Others
CC5 CGT Risk Taking
TR5 SDQ Hyperactivity
CR6 Self Esteem
TR5 SDQ Prosocial
CR6 Anhedonia
CC5 Spatial WM Strategy
CR6 E−Cigarette Use
CR6 Anti−Social Behaviour
TR5 SDQ Peer Problems
CR6 Cannabis Use
CR6 Alcohol Use
TR5 SDQ Conduct Problems
CC6 CGT Risk Taking
CC5 Spatial WM Total Errors
CR6 Self Harm
CR6 Depression
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```
ggsave(filename=file.path("Plots","LoadingsPlots_teach.pdf"),  LoadingPlot, device="pdf", width=9, heigh
ggsave(filename=file.path("Plots","LoadingsPlots_teach.png"),  LoadingPlot, device="png", width=9, heigh
```

Stacked bar chart figure

Figure 3

```
PlotData = data.frame(cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined)
    PlotData[PlotData<0] = 0
    PlotData$Var = rownames(PlotData)
    PlotData = melt(PlotData,ID="Var")
```

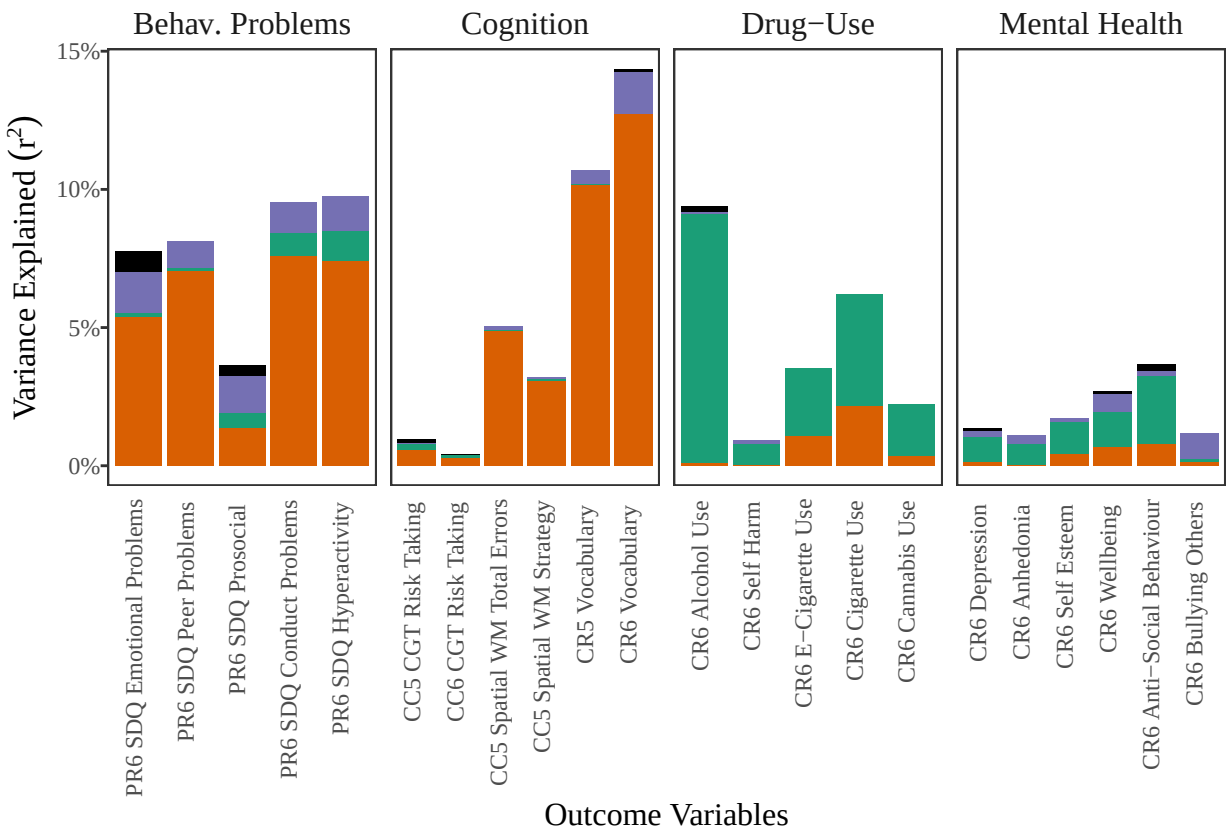
```
## Using Var as id variables
```

```
    PlotData$variable = factor(PlotData$variable)
    PlotData$Cluster = (Outcome_Cluster_Labels2[match(PlotData$Var,outcomes2)])
    PlotData$Cluster[PlotData$Cluster=="Behavioural Problems"] = "Behav. Problems"
    PlotData$Cluster = factor(PlotData$Cluster)
    PlotData$Var = factor(PlotData$Var, levels=Outcome_Ordered2, labels=Outcome_Labels_Ordered2)
  #Fill Colour
FillCol = c(as.vector(  RColorBrewer::brewer.pal(5,"Dark2")), as.vector(wesanderson::wes_palette("Darje

PLOT3=
    ggplot(data=PlotData, aes(x=Var,y=value, fill=variable, group=Cluster)) +
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="LM_R2",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc10",
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc9",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc8",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc7",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc6",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc5",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc4",]
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc3",], i
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc2",], i
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc1",], i
    labs(y=bquote('Variance Explained'~(r^2)), x="Outcome Variables") +
    facet_wrap(~Cluster,strip.position = "top", scales = "free_x", nrow=1) + theme(panel.spacing = unit
    jtools::theme_apa()+
    theme(axis.title.y.right = element_blank(),                # hide right axis title
          axis.text.y.right = element_blank(),                 # hide right axis labels
          axis.ticks.x = element_blank(),                      # hide left/right axis ticks
          axis.text.y = element_text(margin = margin(r = 0)),  # move left axis labels closer to axis
          #panel.spacing = unit(10, "mm"),                     # remove spacing between facets
          strip.background = element_blank(),                  # match default line size of theme_class
          legend.position = "none",
          axis.text.x = element_text(angle = 90,hjust=0.95,vjust=0.2),
          text=element_text(family="serif")
    ) +
    scale_fill_manual(labels = unique(PlotData$variable),values=c( wesanderson::wes_palette("BottleRock
    scale_y_continuous(breaks=c(0,5,10,15)/100, labels=c("0%","5%", "10%", "15%"))
```

```
ggsave(filename=file.path("Plots","VarianceExplained1.pdf"),  PLOT3, device="pdf", width=6, height=4)
ggsave(filename=file.path("Plots","VarianceExplained1.png"),  PLOT3, device="png", width=6, height=4, dp

PLOT3 #+ ylim(c(0,.19))
```



Supplementary Figure 4

```
PlotData = data.frame(cca_splithalf_teacher$R2_matrix_BinaryOutcomes_Combined)
    PlotData[PlotData<0] = 0
    PlotData$Var = rownames(PlotData)
    PlotData = melt(PlotData,ID="Var")
```

```
## Using Var as id variables
```

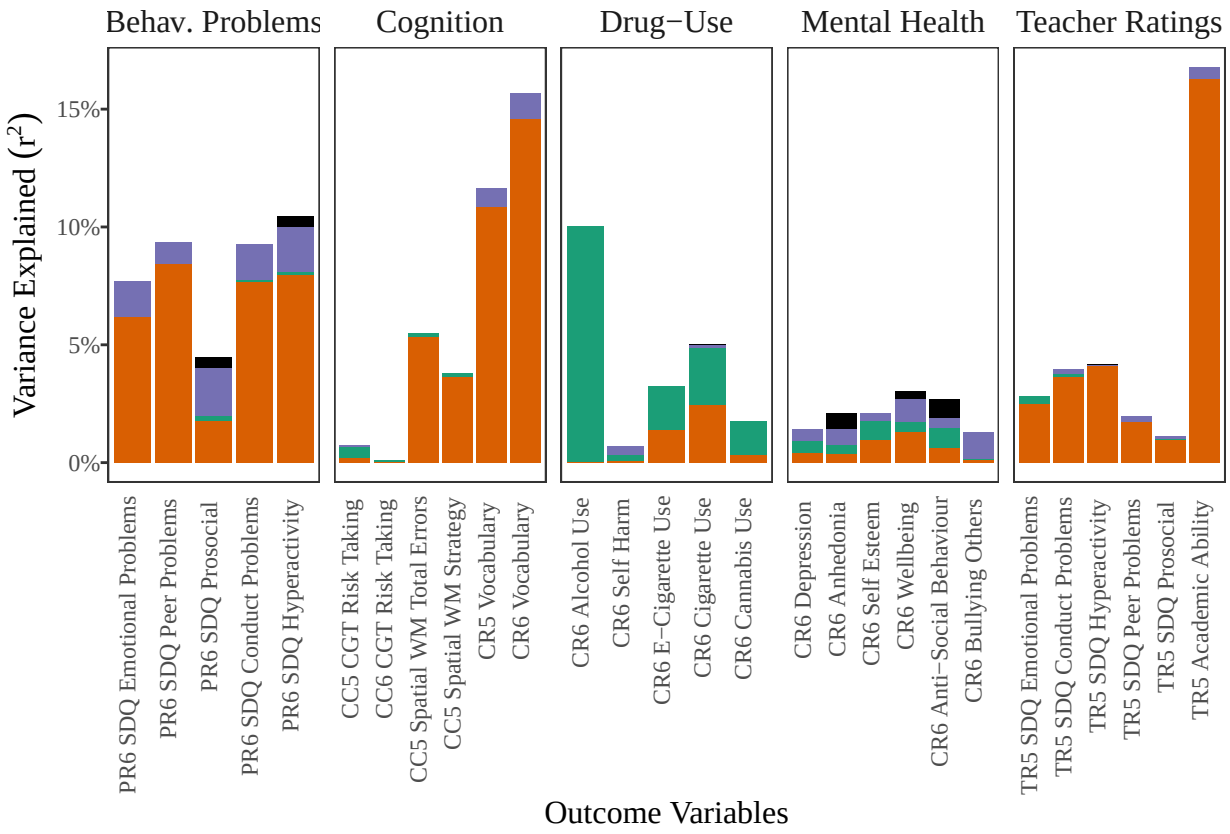
```
    PlotData$variable = factor(PlotData$variable)
    PlotData$Cluster = (Outcome_Cluster_Labels2[match(PlotData$Var,outcomes2)])
    PlotData$Cluster[PlotData$Cluster=="Behavioural Problems"] = "Behav. Problems"
    PlotData$Cluster = factor(PlotData$Cluster)
    PlotData$Var = factor(PlotData$Var, levels=Outcome_Ordered2, labels=Outcome_Labels_Ordered2)

#Fill Colour
FillCol = c(as.vector(  RColorBrewer::brewer.pal(5,"Dark2")), as.vector(wesanderson::wes_palette("Darje
```

```r
PLOT3=
    ggplot(data=PlotData, aes(x=Var,y=value, fill=variable, group=Cluster)) +
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="LM_R2",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc10",
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc9",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc8",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc7",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc6",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc5",]
      # geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc4",]
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc3",], i
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc2",], i
      geom_bar(position="identity",stat="identity", alpha=1, data=PlotData[PlotData$variable=="cc1",], i
    labs(y=bquote('Variance Explained'~(r^2)), x="Outcome Variables") +
    facet_wrap(~Cluster,strip.position = "top", scales = "free_x", nrow=1) + theme(panel.spacing = unit
    jtools::theme_apa()+
    theme(axis.title.y.right = element_blank(),                # hide right axis title
          axis.text.y.right = element_blank(),                 # hide right axis labels
          axis.ticks.x = element_blank(),                      # hide left/right axis ticks
          axis.text.y = element_text(margin = margin(r = 0)),  # move left axis labels closer to axis
          #panel.spacing = unit(10, "mm"),                       # remove spacing between facets
          strip.background = element_blank(),         # match default line size of theme_classic
          legend.position = "none",
          axis.text.x = element_text(angle = 90,hjust=0.95,vjust=0.2),
          text=element_text(family="serif")
    ) +
    scale_fill_manual(labels = unique(PlotData$variable),values=c( wesanderson::wes_palette("BottleRock
  scale_y_continuous(breaks=c(0,5,10,15)/100, labels=c("0%","5%", "10%", "15%"))

ggsave(filename=file.path("Plots","VarianceExplained_teach.pdf"),  PLOT3, device="pdf", width=8, height=
ggsave(filename=file.path("Plots","VarianceExplained_teach.png"),  PLOT3, device="png", width=8, height=

PLOT3 #+ ylim(c(0,.19))
```



Supplementary Figure 2

```
# apply(A3_teach$R2_matrix,2,mean)
# apply(A3_teach$R2_matrix,2,mean)
```

Variance Explained in each outcome tables

Correlation Confidence Interval Fucntion

```
.CorrelationCIEstimator = function(r, n, alpha=0.05){
  Fr = base::atanh(r)                  # Fisher Z Transform
  SE = 1/((n-3)^.5)                # Standard Error
  CI = stats::qnorm(c(alpha/2,1-alpha/2), mean=Fr, sd=SE)
  CI = base::tanh(CI)
  # p  = (1-pnorm(abs(Fr), mean=0, sd=SE))*2    # Fisher Z P value
  t = r*base::sqrt((n-2)/(1-r^2))        # P-value estimated from t-distribution
  p  = (1-stats::pt(base::abs(t), df=n-2))*2
  return(base::list(CI=CI,p=p))
}
```

Table 2

Variance Explained for each outcome variables

```r
absSquare = function(x){
  neg = x<0
  out = x^2
  out[neg] = out[neg]*-1
  return(out)
}



cc1 = cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined$cc1
# First CCA variate
# cc1_CI_LB = sapply(cc1, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[1])  #Need to
# cc1_CI_UB = sapply(cc1, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[2])

# Second CCA variate
cc2 = cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined$cc2
# cc2_CI_LB = sapply(cc2, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[1])
# cc2_CI_UB = sapply(cc2, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[2])

# Third CCA variate
cc3 = cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined$cc3
# cc3_CI_LB = sapply(cc3, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[1])
# cc3_CI_UB = sapply(cc3, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_group2), alpha=0.05)$CI[2])

# Variance Explained by Linear MOdel
LM_VE = cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined$LM_R2


Table2 =
cbind.data.frame(cc1, #absSquare(cc1_CI_LB), absSquare(cc1_CI_UB),
                 cc2, #absSquare(cc2_CI_LB), absSquare(cc2_CI_UB),
                 cc3, #absSquare(cc3_CI_LB), absSquare(cc3_CI_UB),
                 LM_VE
                 )

AverageVE = apply(Table2, 2, mean)
Table2 = rbind.data.frame(Table2, AverageVE)

Table2 %>%
          # format(.,nsmall=3, digits=0) %>%
          # mutate_all(.,str_replace_all, pattern = "0\\.", replacement="\\.") %>%
          dplyr::slice(c(Outcome_Order,23)) %>%
          `rownames<-`(c(Outcome_Labels_Ordered, "Mean")) %>%
          `colnames<-`(c("cc1","cc2","cc3","LM")) %>%
          knitr::kable(digits=3)
```

	cc1	cc2	cc3	LM
PR6 SDQ Emotional Problems	0.054	0.055	0.070	0.078
PR6 SDQ Peer Problems	0.070	0.071	0.081	0.080
PR6 SDQ Prosocial	0.014	0.019	0.032	0.036
PR6 SDQ Conduct Problems	0.076	0.084	0.095	0.093
PR6 SDQ Hyperactivity	0.074	0.085	0.098	0.098
CR6 Depression	0.001	0.010	0.012	0.014
CR6 Anhedonia	-0.001	0.008	0.011	0.010
CR6 Self Esteem	0.004	0.016	0.017	0.017
CR6 Wellbeing	0.007	0.019	0.026	0.027
CR6 Anti-Social Behaviour	0.008	0.033	0.034	0.037
CR6 Bullying Others	0.001	0.002	0.012	0.009
CR6 Alcohol Use	0.001	0.091	0.092	0.094
CR6 Self Harm	-0.001	0.008	0.009	0.007
CR6 E-Cigarette Use	0.011	0.035	0.035	0.033
CR6 Cigarette Use	0.022	0.062	0.062	0.059
CR6 Cannabis Use	0.003	0.022	0.022	0.018
CC5 CGT Risk Taking	0.005	0.008	0.008	0.010
CC6 CGT Risk Taking	0.003	0.004	0.004	0.004
CC5 Spatial WM Total Errors	0.049	0.049	0.050	0.044
CC5 Spatial WM Strategy	0.031	0.031	0.032	0.029
CR5 Vocabulary	0.102	0.102	0.107	0.106
CR6 Vocabulary	0.127	0.127	0.142	0.144
Mean	0.030	0.043	0.048	0.047

```
Table2 %>%
          dplyr::slice(c(Outcome_Order,23)) %>%
          `rownames<-`(c(Outcome_Labels_Ordered, "Mean")) %>%
          `colnames<-`(c("cc1","cc2","cc3","LM")) %>%
          format(., digits=0, nsmall=3) %>%
          apply(., 2, function(x) sub("0\\.","\\.",x, perl=TRUE)) %>%
          write.csv(., file=file.path("Output R Data", "Table2.csv"), row.names = TRUE)




rm(cc1,#cc1_CI_LB,cc1_CI_UB,
   cc2,#cc2_CI_LB,cc2_CI_UB,
   cc3,#cc3_CI_LB,cc3_CI_UB,
  LM_VE
  )
```

```
format(cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined, digits=0, nsmall=4)[,c(1:4,22,23)]
```

```
##                                cc1    cc2    cc3    cc4   cc22  LM_R2
## S6_Parent_SDQ_Emotion       0.0537 0.0550 0.0700 0.0763 0.0777 0.0777
## S6_Parent_SDQ_Conduct       0.0760 0.0840 0.0952 0.0934 0.0932 0.0932
## S6_Parent_SDQ_Hyper         0.0741 0.0848 0.0975 0.0969 0.0976 0.0976
## S6_Parent_SDQ_Peer          0.0702 0.0713 0.0814 0.0836 0.0799 0.0799
## S6_Parent_SDQ_Prosocial     0.0137 0.0189 0.0322 0.0376 0.0362 0.0362
## S6_MentalHealth_HateSelf    0.0012 0.0103 0.0124 0.0150 0.0136 0.0136
## S6_MentalHealth_Tired      -0.0014 0.0076 0.0109 0.0131 0.0103 0.0103
```

```
## S6_SelfEsteem                0.0040 0.0159 0.0173 0.0182 0.0167 0.0167
## S6_Wellbeing                 0.0068 0.0194 0.0260 0.0287 0.0271 0.0271
## S6_RiskyBehaviours_Cig       0.0217 0.0620 0.0618 0.0610 0.0594 0.0589
## S6_RiskyBehaviours_ECig      0.0107 0.0353 0.0354 0.0344 0.0328 0.0325
## S6_RiskyBehaviours_Alcohol   0.0010 0.0910 0.0917 0.0927 0.0943 0.0941
## S6_RiskyBehaviours_Cannabis  0.0035 0.0222 0.0222 0.0218 0.0164 0.0176
## S6_ChildQ_SelfHarm          -0.0013 0.0076 0.0093 0.0111 0.0070 0.0069
## S5_Cog_VS_Ability            0.1017 0.1020 0.1071 0.1069 0.1056 0.1056
## S6_Cog_WordScoreIRT          0.1272 0.1270 0.1424 0.1460 0.1436 0.1436
## S5_Cog_SWM_TotalErrors48     0.0487 0.0489 0.0504 0.0505 0.0441 0.0441
## S5_Cog_SWM_Strategy          0.0307 0.0312 0.0320 0.0323 0.0288 0.0288
## S5_Cog_CGT_RiskTaking        0.0055 0.0076 0.0082 0.0087 0.0097 0.0097
## S6_Cog_CGT_RiskTaking        0.0028 0.0039 0.0036 0.0032 0.0041 0.0041
## S6_AntiSocialBehaviour       0.0079 0.0325 0.0344 0.0342 0.0368 0.0368
## S6_Bullying                  0.0012 0.0023 0.0117 0.0140 0.0090 0.0090
```

```
# format(cca_splithalf_teacher$R2_matrix_unbiased, digits=0, nsmall=4)[,c(1:4,23)]
```

```
apply(cca_splithalf_procrustes$R2_matrix_BinaryOutcomes_Combined,1,which.max)
```

```
##       S6_Parent_SDQ_Emotion       S6_Parent_SDQ_Conduct
##                          10                           3
##         S6_Parent_SDQ_Hyper          S6_Parent_SDQ_Peer
##                          16                           4
##     S6_Parent_SDQ_Prosocial    S6_MentalHealth_HateSelf
##                           8                           8
##       S6_MentalHealth_Tired              S6_SelfEsteem
##                           4                           7
##               S6_Wellbeing      S6_RiskyBehaviours_Cig
##                           6                           2
##     S6_RiskyBehaviours_ECig  S6_RiskyBehaviours_Alcohol
##                           3                           5
## S6_RiskyBehaviours_Cannabis          S6_ChildQ_SelfHarm
##                           8                           4
##           S5_Cog_VS_Ability         S6_Cog_WordScoreIRT
##                           8                           4
##    S5_Cog_SWM_TotalErrors48         S5_Cog_SWM_Strategy
##                           4                           4
##       S5_Cog_CGT_RiskTaking       S6_Cog_CGT_RiskTaking
##                          10                           6
##      S6_AntiSocialBehaviour                 S6_Bullying
##                           5                           8
```

Table 2 - Including Teacher Data

Variance Explained for each outcome variables - TEACHER DATA INCLUDED

```
cc1 = cca_splithalf_teacher$R2_matrix_BinaryOutcomes_Combined$cc1
# First CCA variate
# cc1_CI_LB = sapply(cc1, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[1])
# cc1_CI_UB = sapply(cc1, function(x)
```

```
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[2])

# Second CCA variate
cc2 = cca_splithalf_teacher$R2_matrix_BinaryOutcomes_Combined$cc2
# cc2_CI_LB = sapply(cc2, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[1])
# cc2_CI_UB = sapply(cc2, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[2])

# Third CCA variate
cc3 = cca_splithalf_teacher$R2_matrix_BinaryOutcomes_Combined$cc3
# cc3_CI_LB = sapply(cc3, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[1])
# cc3_CI_UB = sapply(cc3, function(x)
#                .CorrelationCIEstimator(x^.5, n=nrow(df0_imputed_Teach_group2), alpha=0.05)$CI[2])

# Variance Explained by Linear MOdel
LM_VE = cca_splithalf_teacher$R2_matrix_BinaryOutcomes_Combined$LM_R2


Table2 =
cbind.data.frame(cc1,
                 cc2,
                 cc3,
                 LM_VE
                 )

AverageVE = apply(Table2, 2, mean)
Table2 = rbind.data.frame(Table2, AverageVE)

Table2 %>%
          # format(.,nsmall=3, digits=0) %>%
          # mutate_all(.,str_replace_all, pattern = "0\\.", replacement="\\.") %>%
          dplyr::slice(c(match(Outcome_Ordered2, outcomes2),29)) %>%
          `rownames<-`(c(Outcome_Labels_Ordered2, "Mean")) %>%
          `colnames<-`(c("cc1","cc2","cc3","LM")) %>%
          knitr::kable(digits=3)
```

	cc1	cc2	cc3	LM
TR5 SDQ Emotional Problems	0.025	0.028	0.028	0.022
TR5 SDQ Conduct Problems	0.036	0.038	0.040	0.040
TR5 SDQ Hyperactivity	0.041	0.041	0.042	0.042
TR5 SDQ Peer Problems	0.017	0.017	0.020	0.010
TR5 SDQ Prosocial	0.010	0.010	0.011	0.008
TR5 Academic Ability	0.163	0.162	0.168	0.166
PR6 SDQ Emotional Problems	0.062	0.062	0.077	0.077
PR6 SDQ Peer Problems	0.084	0.083	0.094	0.075
PR6 SDQ Prosocial	0.018	0.020	0.040	0.045
PR6 SDQ Conduct Problems	0.077	0.077	0.093	0.088
PR6 SDQ Hyperactivity	0.080	0.081	0.100	0.104
CR6 Depression	0.004	0.009	0.014	0.009
CR6 Anhedonia	0.004	0.008	0.014	0.021
CR6 Self Esteem	0.009	0.018	0.021	0.020

	cc1	cc2	cc3	LM
CR6 Wellbeing	0.013	0.017	0.027	0.030
CR6 Anti-Social Behaviour	0.006	0.015	0.019	0.027
CR6 Bullying Others	0.001	0.002	0.013	0.004
CR6 Alcohol Use	-0.001	0.100	0.100	0.100
CR6 Self Harm	0.000	0.003	0.007	-0.002
CR6 E-Cigarette Use	0.014	0.032	0.032	0.031
CR6 Cigarette Use	0.024	0.049	0.050	0.050
CR6 Cannabis Use	0.003	0.018	0.018	0.000
CC5 CGT Risk Taking	0.002	0.007	0.007	0.001
CC6 CGT Risk Taking	-0.001	0.001	0.001	-0.008
CC5 Spatial WM Total Errors	0.053	0.055	0.055	0.049
CC5 Spatial WM Strategy	0.036	0.038	0.035	0.026
CR5 Vocabulary	0.108	0.108	0.116	0.108
CR6 Vocabulary	0.146	0.146	0.157	0.157
Mean	0.037	0.044	0.050	0.046

```
rm(cc1,#cc1_CI_LB,cc1_CI_UB,
   cc2,#cc2_CI_LB,cc2_CI_UB,
   cc3,#cc3_CI_LB,cc3_CI_UB,
  LM_VE
  )
```

Supplementary Alcohol Plots

```
  load(file.path("Data","MCS Data","Processed Data","DataWithExclusionsNoImputations","df0_BothGroups_F

  ##SES and alcohol use - SUPPLEMENTARY MATERIALS
  #Recode variables so that higher alcohol use is greater, and normalise vars
    df0$S1_Parent_AlcoholCurrent_REVERSED = (Convert(df0$S1_Parent_AlcoholCurrent,1:7,7:1))
```

```
## before
##    1    2    3    4    5    6    7
##  404  377 1419 4468 3819 3562 4480
## after
##    1    2    3    4    5    6    7
## 4480 3562 3819 4468 1419  377  404
```

```
    df0$S1_Parent_AlcoholPregnant_REVERSED = (Convert(df0$S1_Parent_AlcoholPregnant,1:7,7:1))
```

```
## before
##     1     2     3     4     5     6     7
##    68    48   201  1270  1268  2461 13180
## after
##     1     2     3     4     5     6     7
## 13180  2461  1268  1270   201    48    68
```

```
    df0$S1_Parent_AlcoholCurrent_REVERSED_NORM = (Convert(df0$S1_Parent_AlcoholCurrent,1:7,7:1))
```

```
## before
##    1    2    3    4    5    6    7
##  404  377 1419 4468 3819 3562 4480
## after
##    1    2    3    4    5    6    7
## 4480 3562 3819 4468 1419  377  404
```

```
    df0$S1_Parent_AlcoholPregnant_REVERSED_NORM = (Convert(df0$S1_Parent_AlcoholPregnant,1:7,7:1))
```

```
## before
##     1     2     3     4     5     6     7
##    68    48   201  1270  1268  2461 13180
## after
##     1     2     3     4     5     6     7
## 13180  2461  1268  1270   201    48    68
```

```
  # brewer.pal(n = 4, name = "Dark2")

  # Parents and children's alcohol consumption (without using normed data)
  # ggplot(data=df0, aes(y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholCurrent_REVERSED)) + geom_hline(y
  #   jtools::theme_apa() + scale_x_continuous(breaks=1:7, labels = c("Never", "<1 Month","1-2 Times a
  #   geom_boxplot(aes(group=S1_Parent_AlcoholCurrent_REVERSED),col="black", fill="#1B9E77", outlier.sh
  #   coord_flip() + labs(y="Equivilised Income (ADOEDE00) Normalised",x="Alcohol Consumption After Pre
  #
  #
  # ggplot(data=df0, aes(y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholPregnant_REVERSED)) + geom_hline(
  #   jtools::theme_apa() + scale_x_continuous(breaks=1:7, labels = c("Never", "<1 Month","1-2 Times a
  #   geom_boxplot(aes(group=S1_Parent_AlcoholPregnant_REVERSED),col="black", fill="#D95F02", outlier.s
  #   coord_flip() + labs(y="Equivilised Income (ADOEDE00) Normalised",x="Alcohol Consumption During Pr

  # Alcohol Consumption after pregnancy and family income
  p1=
  ggplot(data=df0, aes(y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholCurrent_REVERSED)) + geom_hline(yin
    geom_smooth(aes( y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholCurrent_REVERSED_NORM), method="lm", s
    geom_jitter(aes(y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholCurrent_REVERSED_NORM-.35),width=.095,
    jtools::theme_apa() +
    scale_x_continuous(breaks=sort(na.omit(unique(df0$S1_Parent_AlcoholCurrent_REVERSED_NORM))), labels
    geom_boxplot(aes(group=S1_Parent_AlcoholCurrent_REVERSED_NORM, y=S1_SES_EquivIncome_Norm,x=S1_Paren
    coord_flip() + labs(y="Equivilised Income (ADOEDE00) Normalised",x="Alcohol Consumption After Pregna
    ggtitle("A")

  # Alcohol Consumption DURING pregnancy and family income
  p2=
  ggplot(data=df0, aes(y=S1_Parent_AlcoholCurrent_REVERSED_NORM,x=S1_Parent_AlcoholPregnant_REVERSED_NOR
    geom_smooth(aes( y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholPregnant_REVERSED_NORM), method="lm",
    geom_jitter(aes(y=S1_SES_EquivIncome_Norm,x=S1_Parent_AlcoholPregnant_REVERSED_NORM-.35),width=.095
    jtools::theme_apa() +
    scale_x_continuous(breaks=sort(na.omit(unique(df0$S1_Parent_AlcoholPregnant_REVERSED_NORM))), label
    geom_boxplot(aes(group=S1_Parent_AlcoholPregnant_REVERSED_NORM, y=S1_SES_EquivIncome_Norm,x=S1_Pare
    coord_flip() + labs(y="Equivilised Income (ADOEDE00) Normalised",x="Alcohol Consumption During Preg
```

```
  ggtitle("B")

#Parent and children's alcohol
df0$S6_RiskyBehaviours_Alcohol_factor = factor(df0$S6_RiskyBehaviours_Alcohol, levels=c(0,1),labels=c

#Tables used to add count information to plots
Table_1 = table(df0$S6_RiskyBehaviours_Alcohol_factor, df0$S1_Parent_AlcoholCurrent_REVERSED_NORM)
  Table_1 = melt(Table_1)
  Table_1$y = rep(c(.85,.15),7)
Table_2 = table(df0$S6_RiskyBehaviours_Alcohol_factor, df0$S1_Parent_AlcoholPregnant_REVERSED_NORM)
  Table_2 = melt(Table_2)
  Table_2$y = rep(c(.85,.15),7)

#Parent alcohol consumption after pregnancy and CHILDREN"S consumption
p3=
ggplot(data=df0[!is.na(df0$S6_RiskyBehaviours_Alcohol),], aes(x=(S1_Parent_AlcoholCurrent_REVERSED_NO
  geom_bar(position="fill",stat="count", width=.4) +
  scale_x_continuous(breaks=sort(na.omit(unique(df0$S1_Parent_AlcoholCurrent_REVERSED_NORM))), labels
  jtools::theme_apa() + theme(axis.text.x = element_text(angle = 90)) +
  labs(x="Alcohol Consumption After Pregnancy (amaldr00)", y = "Children's Alcohol Consumption (Pink =
  geom_text(data=Table_1,aes(y=y,x=Var2,fill=NULL,label=value), angle=90) + theme(legend.position = "n
  scale_fill_manual(values = c("#1B9E77", "#E7298A"))+
  scale_y_continuous(breaks=seq(0,1,by=.25), labels=c("0%","25%","50%","75%","100%")) +
  ggtitle("C")

#Parent alcohol consumption during pregnancy and CHILDREN"S consumption
p4=
ggplot(data=df0[!is.na(df0$S6_RiskyBehaviours_Alcohol),], aes(x=(S1_Parent_AlcoholPregnant_REVERSED_NO
  geom_bar(position="fill",stat="count", width=.4) +
  scale_x_continuous(breaks=sort(na.omit(unique(df0$S1_Parent_AlcoholPregnant_REVERSED_NORM))), labels
  jtools::theme_apa() + theme(axis.text.x = element_text(angle = 90)) +
  labs(x="Alcohol Consumption During Pregnancy (amdrof00)", y = "Children's Alcohol Consumption (Pink
  geom_text(data=Table_2,aes(y=y,x=Var2,fill=NULL,label=value), angle=90) + theme(legend.position = "n
  scale_fill_manual(values = c("#1B9E77", "#E7298A"))+
  scale_y_continuous(breaks=seq(0,1,by=.25), labels=c("0%","25%","50%","75%","100%")) +
  ggtitle("D")


# Combine plots

p1 + p2 + p3 + p4
```

```
## Warning: Removed 896 rows containing non-finite values (stat_smooth).
```

```
## Warning: Removed 714 rows containing missing values (stat_boxplot).
```

```
## Warning: Removed 182 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 896 rows containing missing values (geom_point).
```

```
## Warning: Removed 929 rows containing non-finite values (stat_smooth).
```

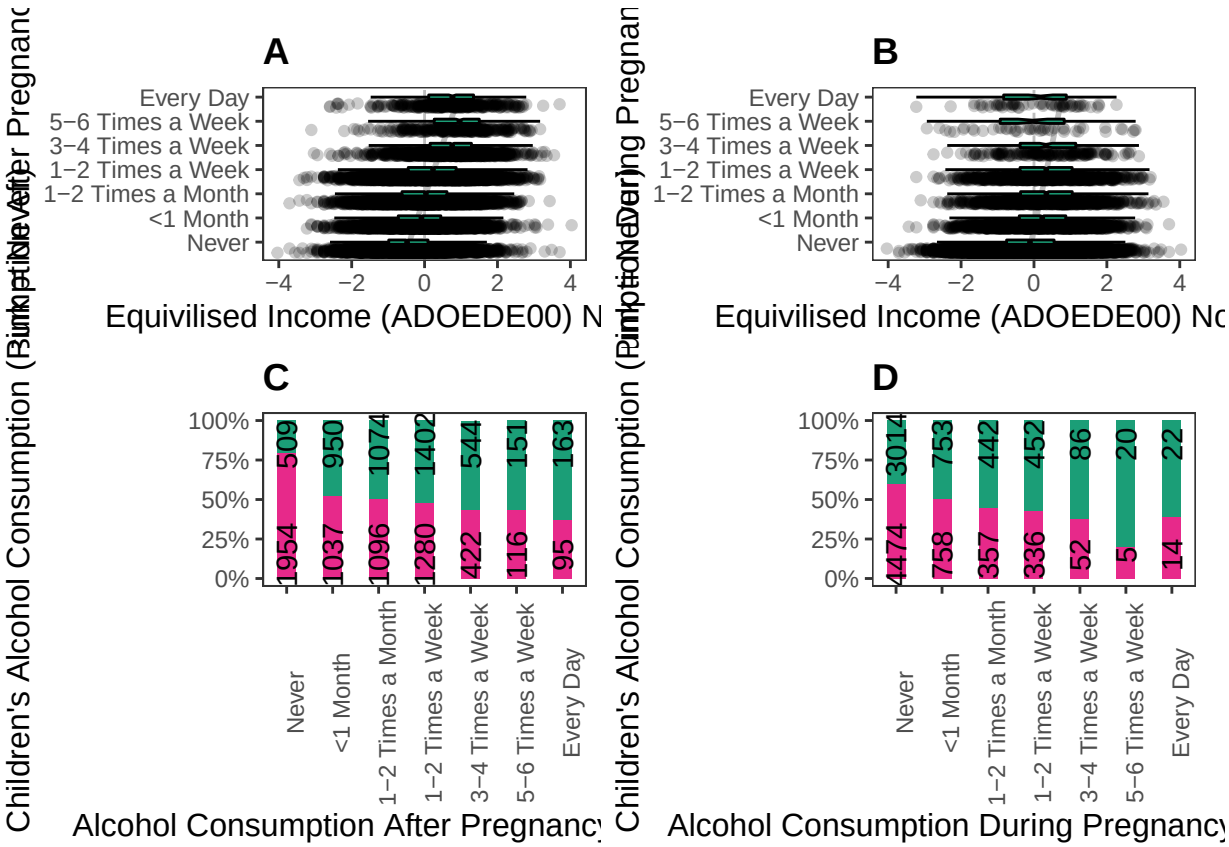
```
## Warning: Removed 747 rows containing missing values (stat_boxplot).

## Warning: Removed 182 rows containing non-finite values (stat_boxplot).

## Warning: Removed 929 rows containing missing values (geom_point).

## Warning: Removed 400 rows containing non-finite values (stat_count).

## Warning: Removed 408 rows containing non-finite values (stat_count).
```




```
ggsave(file="Plots/Alcohol_SupplementaryFigure.png", device="png", width = 15, height = 10)
```

```
## Warning: Removed 896 rows containing non-finite values (stat_smooth).

## Warning: Removed 714 rows containing missing values (stat_boxplot).

## Warning: Removed 182 rows containing non-finite values (stat_boxplot).

## Warning: Removed 896 rows containing missing values (geom_point).

## Warning: Removed 929 rows containing non-finite values (stat_smooth).

## Warning: Removed 747 rows containing missing values (stat_boxplot).
```

```
## Warning: Removed 182 rows containing non-finite values (stat_boxplot).

## Warning: Removed 929 rows containing missing values (geom_point).

## Warning: Removed 400 rows containing non-finite values (stat_count).

## Warning: Removed 408 rows containing non-finite values (stat_count).
```

```
  pdf(file="Plots/Alcohol_SupplementaryFigure.pdf", width=15, height=10)
  p1 + p3 + p2 + p4
```

```
## Warning: Removed 896 rows containing non-finite values (stat_smooth).

## Warning: Removed 714 rows containing missing values (stat_boxplot).

## Warning: Removed 182 rows containing non-finite values (stat_boxplot).

## Warning: Removed 896 rows containing missing values (geom_point).

## Warning: Removed 400 rows containing non-finite values (stat_count).

## Warning: Removed 929 rows containing non-finite values (stat_smooth).

## Warning: Removed 747 rows containing missing values (stat_boxplot).

## Warning: Removed 182 rows containing non-finite values (stat_boxplot).

## Warning: Removed 929 rows containing missing values (geom_point).

## Warning: Removed 408 rows containing non-finite values (stat_count).
```

```
  dev.off()
```

```
## pdf
##   2
```