This supplementary material consists of four parts. The first part includes chi-squared test results for goodness-of-fit, hypothesizing that the cell counts are equal in symptom presence between pre- and post-test conditions. The second part includes the R-codes used to draw a difference and a sum 2-D maps and then to estimate visually inspected associations with correlations to enhance interpretation. The R-codes also include the contingency table used for the present study and a researcher may replicate the 2-D maps and correlational results. The Third part is designed to explain how to identify sum and difference dimensions from the matched CA results; unlike other CA approaches, matched CA uniquely estimate sum and difference dimensions. The dimensional coordinates are summarized in Table 1. The fourth part includes the correlational results and each (row and column) category's contribution in a difference 2-D map; these results are summarized in Table 3.

Part 1: Conduct Chi-Squared Tests for Goodness-Of-Fit for Pre- and Post-Treatment Conditions

As shown in Table 1, none of the chi-squared test results for the psychiatric symptom indicators was favorable for the post-treatment condition. These chi-squared test results were consistent with the matched CA results and 12 age groups were positively related with all psychiatric symptoms, except *De* (depression not otherwise specified). There were several significant results found among age groups (which were "red" highlighted); however, the cell counts in the post-treatment condition were larger than the cell counts in the pre-treatment condition, indicating that the psychiatric symptoms were even worsened after treatment. The frequencies in *De* were consistently smaller among age groups in post-treatment than in pre-treatment; this result was consistent with the *De* symptom location (opposite to all other symptom indicators) in Figure 1 (a difference 2-D map) included in the main text.

TABLE 1

Chi-Squared Tests for Goodness-Of-Fit in Psychiatric Symptom Presence Indicators between Pre- and Post-Treatment Conditions

	postMa	preMa	p-value	postDy	preDy	p-value	postDe	preDe	p-value	postPo	prePo	p-value
a1	19	19	1	3	1*	0.3173	20	25	0.4561	3	2*	0.6547
a2	252	251	0.9644	23	24	0.8840	191	225	0.0955	51	42	0.3507
a3	437	441	0.8926	29	25	0.5862	294	343	0.0522	**125**	92	**0.0251**
a4	419	411	0.7813	108	101	0.6282	251	274	0.3155	110	91	0.1802
a5	377	363	0.6068	79	71	0.5136	201	215	0.4925	117	98	0.195
a6	233	228	0.8159	56	54	0.8488	125	139	0.3889	72	69	0.8005
a7	141	141	1	32	33	0.9013	90	95	0.7132	65	54	0.3133
a8	157	152	0.7761	27	23	0.5716	59	71	0.2926	60	48	0.2482
a9	108	106	0.8913	18	21	0.631	60	67	0.5345	52	44	0.4142
a10	308	298	0.6846	82	66	0.1884	139	169	0.0874	139	121	0.2643
a11	152	145	0.6846	33	29	0.6115	59	71	0.2926	76	58	0.1200
a12	36	35	0.9055	7	3	0.2059	10	11	0.8273	5	6	0.7630
	postOb	preOb	p-value	postGe	preGe	p-value	postAn	preAn	p-value	postSo	preSo	p-value
a1	14	9	0.2971	11	8	0.4913	10	15	0.3173	2	2*	1
a2	98	74	0.06725	109	89	0.1552	232	213	0.3678	**31**	14	**0.0113**
a3	**186**	143	**0.0178**	216	195	0.3003	337	332	0.8467	**75**	47	**0.0112**
a4	160	127	0.0514	**227**	171	**0.0050**	254	242	0.59	60	42	0.0747
a5	134	117	0.2833	**207**	160	**0.0142**	228	224	0.8508	56	39	0.0811
a6	73	66	0.5527	**130**	100	**0.0479**	134	138	0.8084	**47**	27	**0.0201**
a7	54	46	0.4237	70	54	0.1508	90	85	0.7055	16	8	0.1025
a8	51	40	0.2489	80	62	0.1309	72	76	0.7423	19	15	0.4927
a9	50	39	0.2436	46	37	0.3232	56	57	0.9251	12	5	0.0896
a10	89	76	0.3115	164	138	0.1346	145	152	0.6846	32	21	0.1308
a11	47	40	0.453	71	54	0.1284	77	75	0.8711	19	16	0.6121

a12	10	4	0.1088	16	14	0.715	12	13	0.8415	4	2*	0.4142

Note. * = chi-squared approximation may be incorrect because of insufficient cell counts. Ma = presence of major depressive disorder; Dy = dysthymia; De = depression not otherwise specified; Po = post traumatic stress disorder; Ob = obsessive compulsive disorder; Ge = generalized anxiety disorder; An = anxiety disorder not otherwise specified; and So = social phobia. a1 = ages 12-13; a2 = ages 14-15; a3 = ages 16-17; a4 = ages 18-19; a5 = ages 20-21; a6 = ages 22-23; a7 = ages 24-25; a8 = ages 26-27; a9 = ages 28-29; a10 = ages 30-39; a11 = ages 40-49; and a12 = ages 50-68.

Part 2: The R Code for Drawing a Difference 2-D Map and Computing Correlations

```
install.packages('ca')

library(ca)

# Create concatenated crosstabulation for matched CA
# Md2 = Md at posttreatment; Md = Md at pretreatment/baseline
# See the note in Table 1 for the symptom full names
# a1 = age 1 at posttreatment; g1 = age 1 at pretreatment
# a1/g1=ages 12-13; a2/g2=ages 14-15; a3/g3=ages 16-17; a4/g4=ages 18=19;
# a5/g5=ages # 20-21; a6/g6=ages 22-23; a7/g7= ages 24-25; a8/g8=ages 26-27;
# a9/g9 ages=28-29; a10/g10 ages=30-39; a11/g11 ages=40-49; a12/g12 ages=50-68
```

##read.data

```
tmp <- read.table(text="      Ma2     Dy2     De2     Po2     Ob2     Ge2     An2     So2     Ma      Dy
       De      Po      Ob      Ge      An      So
                  g1  19      3       20      3       14      11      10      2       19      1       25      2
       9       8       15      2
                  g2  252     23      191     51      98      109     232     31      251     24      225
       42      74      89      213     14
                  g3  437     29      294     125     186     216     337     75      441     25      343
       92      143     195     332     47
                  g4  419     108     251     110     160     227     254     60      411     101     274
       91      127     171     242     42
                  g5  377     79      201     117     134     207     228     56      363     71      215
       98      117     160     224     39
                  g6  233     56      125     72      73      130     134     47      228     54      139
       69      66      100     138     27
                  g7  141     32      90      65      54      70      90      16      141     33      95
       54      46      54      85      8
                  g8  157     27      59      60      51      80      72      19      152     23      71
       48      40      62      76      15
                  g9  108     18      60      52      50      46      56      12      106     21      67
       44      39      37      57      5
                  g10 308     82      139     139     89      164     145     32      298     66      169
       121     76      138     152     21
                  g11 152     33      59      76      47      71      77      19      145     29      71
       58      40      54      75      16
                  g12 36      7       10      5       10      16      12      4       35      3       11      6
       4       14      13      2
                  a1  19      1       25      2       9       8       15      2       19      3       20      3
       14      11      10      2
                  a2  251     24      225     42      74      89      213     14      252     23      191
       51      98      109     232     31
                  a3  441     25      343     92      143     195     332     47      437     29      294
       125     186     216     337     75
                  a4  411     101     274     91      127     171     242     42      419     108     251
       110     160     227     254     60
                  a5  363     71      215     98      117     160     224     39      377     79      201
       117     134     207     228     56
                  a6  228     54      139     69      66      100     138     27      233     56      125
       72      73      130     134     47
                  a7  141     33      95      54      46      54      85      8       141     32      90
       65      54      70      90      16
                  a8  152     23      71      48      40      62      76      15      157     27      59
       60      51      80      72      19
                  a9  106     21      67      44      39      37      57      5       108     18      60
       52      50      46      56      12
                  a10 298     66      169     121     76      138     152     21      308     82      139
       139     89      164     145     32
                  a11 145     29      71      58      40      54      75      16      152     33      59
       76      47      71      77      19
```

```
                a12 35      3       11      6       4       14      13      2       36      7       10      5
        10      16      12      4",
                header=TRUE)

myca <- ca(tmp, 15)
summary(myca)
```

The biplot for two sum-dimensions (1 & 3)

 # We admit that although "rowgreen" (which multiplies the columns standard coordinates by the
 # square root of the masses) is a better option statistically, the rowgreen-biplot was
 # not legible with our current data set, especially the age groups were too closely bundled.
 # The visual inspection of associations between age groups and psychiatric symptom-presence
 # indicators was critical in the present study. Therefore, to enhance legibility, we had to
 # rely on a "rowgab" biplot (rows in principal coordinates and columns in standard coordinates
 # times masses).

```
plot(myca, mass=TRUE,  map="rowgab", arrows=c(FALSE,TRUE), dim=c(1,3))

# The sum 2-D map which is quite different from the difference 2-D plot (Figure 1) that was
# included in the main text. The correlational results estimated from the sum 2-D map
# are not correct because the results are not based on optimally scaled differences
# between baseline and posttreatment.
```

 # Note that we edited the sum 2-D map in Adobe because the "rowgab" option includes redundant
 # information (e.g., age groups for Pre and Post and the psychiatric symptoms for Pre and Post),
 # so in the sum 2-D map we removed the redundant information. We did the same thing for Figure 1
 # included in the main text (Letter).

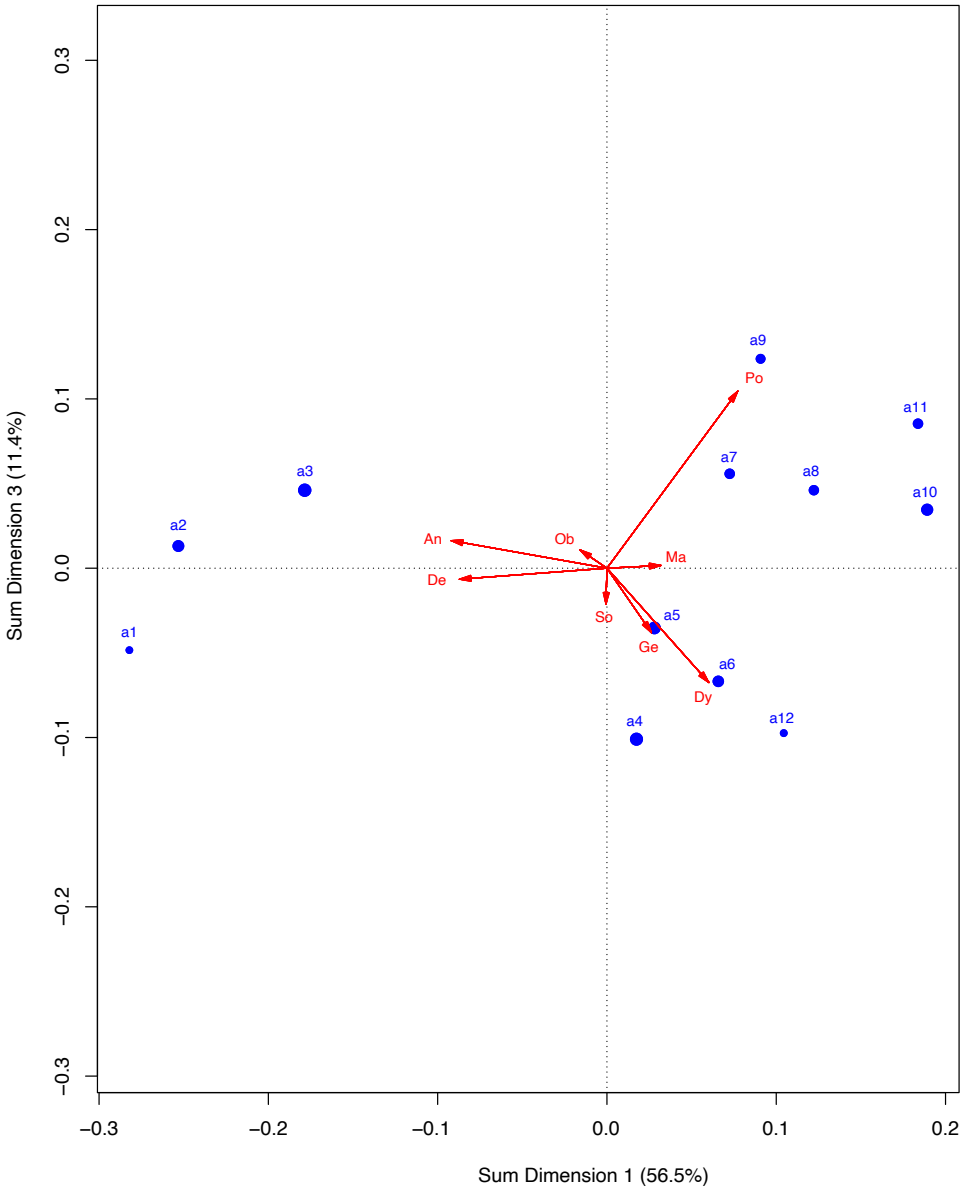

Figure 2. The 2-D Plot Constructed with Sum Dimensions 1 and 3.

Ma = presence of major depressive disorder; Dy = dysthymia; De = depression not otherwise specified; Po = post traumatic stress disorder; Ob = obsessive compulsive disorder; Ge = generalized anxiety disorder; An = anxiety disorder not otherwise specified; and So = social phobia. a1 = ages 12-13; a2 = ages 14-15; a3 = ages 16-17; a4 = ages 18-19; a5 = ages 20-21; a6 = ages 22-23; a7 = ages 24-25; a8 = ages 26-27; a9 = ages 28-29; a10 = ages 30-39; a11 = ages 40-49; and a12 = ages 50-68.

```
## The biplot for two difference-dimensions (2 & 7) was included in the letter

# Use a visualization "rowgab" option on page 266 in Greenacre, M. J. (2017). Correspondence Analysis in
# Practice. 3nd ed. Boca Raton, FL: Chapman & Hall/CRC.

plot(ca(tmp), mass=TRUE, map="rowgab", arrows=c(FALSE,TRUE), dim=c(2,7))

### Estimate Category Correlations

## choose (1, 3) for sum-dimensional correlations
## choose (2, 7) for difference-dimensional correlations, which was our main interest

#plane <- c(1, 3) # for a sum 2-D map
```

```
plane <- c(2, 7) # for a difference 2-D map

###############################################

myca$rowcoord <- myca$rowcoord %*% diag(myca$sv)
row.scores=myca$rowcoord

#compute row scores for the data
#note that we can use row scores or row weights tmp.svd$u
row.corrs=matrix(nrow=nrow(tmp),ncol=nrow(tmp))

#create a matrix to hold the row correlations
rownames(row.corrs)=rownames(tmp) #add the labels for columns
colnames(row.corrs)=rownames(tmp) #add the labels for columns

#### ROW category correlations ####

#rads to degs 57.2957795 degrees
#remember atan2 is (y, x)
convert=57.29577958
for(i in 1:nrow(row.corrs)){ #for each row in the data
  row1=atan2(row.scores[i,plane[1]],
             row.scores[i,plane[2]])*convert
  #get the arctan on plane
  for(j in 1:ncol(row.corrs)){ #for row j
    row2=atan2(row.scores[j,plane[1]],
               row.scores[j,plane[2]])*convert
    #get the arctan on designated plane
    row.corrs[i,j]=cos((row1-row2)/convert)
    #subtract the two dimensions to get the angle between them,
    #convert it into degrees from radians, get the cosine of the angle
    #(which is the correlation between row i and j)
  }
}
round(row.corrs,2)


#### COLUMN category correlations #####

column.scores=myca$colcoord

#to get correlations between columns:
column.corrs=matrix(nrow=ncol(tmp),
                    ncol=ncol(tmp)) #create a matrix to hold the row correlations
rownames(column.corrs)=colnames(tmp) #add the labels for columns
colnames(column.corrs)=colnames(tmp) #add the labels for columns

for(i in 1:nrow(column.corrs)){ #for each var in the data
  column1=atan2(column.scores[i,plane[1]],
                column.scores[i,plane[2]])*convert
  #get the arctan on designated plane
  for(j in 1:ncol(column.corrs)){ #for var j
    column2=atan2(column.scores[j,plane[1]],
                  column.scores[j,plane[2]])*convert
    #get the arctan on plane
    column.corrs[i,j]=cos((column1-column2)/convert)
    #subtract the plane to get the angle between them,
    #convert it into degrees from radians, get the cosine of the angle
    #(which is the correlation between row i and j)
  }
}
round(column.corrs,2)


##### ROW & COLUMN category correlations ####
##### Using Greenacre p 98 to calculate cos(theta)

row.col.corrs.rsc=matrix(nrow=nrow(tmp),
                     ncol=ncol(tmp))
colnames(row.col.corrs.rsc)=colnames(tmp) #add the labels for columns
rownames(row.col.corrs.rsc)=rownames(tmp) #add the labels for columns

for(i in 1:nrow(tmp)){ #for each var in the data

  # length of row vector in plane
```

```
  row=sqrt(myca$rowcoord[i,plane[1]]^2+myca$rowcoord[i,plane[2]]^2)


  for(j in 1:ncol(tmp)){ #for var j

    #length of column vector in plane
    column=sqrt(myca$colcoord[j,plane[1]]^2+myca$colcoord[j,plane[2]]^2)

    # cross product of row and column vectors in plane
    rtc=t(myca$rowcoord[i,c(plane[1],plane[2])])%*%myca$colcoord[j,c(plane[1],plane[2])]

    #costheta is cross product divided by the product of the lengths of row and colum vectors
    costheta=rtc/(row*column)

    # Save the value in the cor matrix
    row.col.corrs.rsc[i,j]=costheta

  }
}
round(row.col.corrs.rsc,2)
```

Part 3: How to Identify Sum and Difference Dimensions?

In a concatenated matrix, the rows and columns are repeated twice, and matched CA estimates two sets of identical row and column coordinates up to possible sign changes. In the case of a 24 × 16 table, if the first 12 coordinate values in the rows are identical to the last 12 coordinate values in a given dimension, the dimension corresponds to the sum A (aftertreatment) + B (baseline) (equivalently between-age of treatment) (see Dim1 and Dim3 in Table 1). On the other hand, if the first 12 row coordinate values are opposite to the last 12 values in a given dimension, the dimension corresponds to the difference, A – B (equivalently within-age of treatment differences) (see Dim2 and Dim7 in Table 2).

TABLE 2

Standard Coordinates from Matched CA of a 24 x 16 Concatenated Matrix

Symptom	Dim1	Dim3	.	Dim11	Dim2	Dim7	.	Dim15
Ma	0.232143	0.011702	.	-0.770616	-0.120065	0.336590	.	-1.844440
Dy	2.417132	-2.712085	.	0.252162	-0.644508	2.806287	.	0.674514
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
So	-0.037066	-1.319237	.	-2.015169	-2.918518	-2.987181	.	-0.139790
Ma	0.232143	0.011702	.	-0.770616	0.120065	-0.336590	.	1.844440
Dy	2.417132	-2.712085	.	0.252162	0.644508	-2.806287	.	-0.674514
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
So	-0.037066	-1.319237	.	-2.015169	2.918518	2.987181	.	0.139790
	Sum	Sum	.	Sum	Difference	Difference	.	Difference
	56.5%	11.4%	.	0.4%	15.7%	1%	.	0%
Total				81%				19%

Note. The coordinates of the first two differences were boxed. Ma = presence of major depressive disorder; Dy = dysthymia; De = depression not otherwise specified; Po = post traumatic stress disorder; Ob = obsessive compulsive disorder; Ge = generalized anxiety disorder; An = anxiety disorder not otherwise specified; and So = social phobia.

Although matched CA allows us to estimate sum and difference dimensions separately, our main interest in the study is to examine the difference dimensions; specifically, we want to study positions of psychiatric symptom points projected onto a 2-D map where the horizontal axis is made with the first difference dimension and the vertical axis with the second difference dimension.

Interpreting symptom points in a difference 2-D map. A 2-D map includes configurations of the After – Before differences in both age groups and symptoms. The differences signify the reminiscent comorbidity appearing in the age groups and the psychiatric symptoms. These differences are displayed as age group points and symptom points in the 2-D map (see Figure 1 in the letter). The age group points indicate the degree of improvement or deterioration aggregated over all psychiatric symptom effects or comorbidity, whereas the symptom points represent the degree of improvement or deterioration aggregated over all age groups. In either way, if the points are close to the origin of (0, 0), this implies no change in comorbidity after treatment; if the points are at the left (negative) side of the origin, this implies improvement in comorbidity after treatment; and if the points are at the right (positive) side of the origin, this implies deterioration in comorbidity after treatment.

Part 4: Interpretation of Correlations

Using the R code included here, we estimated correlations between row categories; between column categories; and between row and column categories. However, since we were interested in the correlations between row and column categories (the 3rd Part in the R code), we included only row-column category correlations in Table 2. In the table, we boxed only the correlations (equal to or larger than 0.6) cross-tabulated between age groups whose contributions were above the average (8.3% = 100%/12) and the psychiatric symptoms whose contributions were above the average (12.5% = 100%/8). The contributions of age groups and symptom indicators were calculated with the information provided in the “ctr” column in the results from the R code, “summary(myca)” included in Part 1.

According to the boxed correlations, ages 14-15 (12%), ages 16-17 (18%), ages 18-19 (15%), ages 20-21 (11%), ages 22-23 (9%), and ages 30-39 (10%) were highly related with obsessive compulsive disorder (18%), generalized anxiety disorder (25%), and social phobia (27%), implying that these age groups would be more venerable to these three symptoms than any other psychiatric symptoms.

TABLE 3

The Symptom Contributions (%) in a Difference 2-D Map and Correlations between Age Groups and Psychiatric Symptoms in the Map.

Cont. %	Ma (1%)	Dy (4%)	De (12%)	Po (12%)	**Ob (18%)**	**Ge (25%)**	An (1%)	**So (27%)**
Ages 12-13 (2%)	0.81	0.74	-0.75	1	0.75	1	-0.48	0.17
Ages 14-15 (12%)	0	-0.11	-0.97	0.65	**0.97**	**0.63**	0.43	**0.9**
Ages 16-17 (18%)	0.16	0.04	-1	0.76	**1**	**0.75**	0.28	**0.82**
Ages 18-19 (15%)	0.38	0.27	-0.99	0.89	**0.99**	**0.88**	0.05	**0.66**
Ages 20-21 (11%)	0.45	0.34	-0.97	0.92	**0.97**	**0.91**	-0.02	**0.61**
Ages 22-23 (9%)	0.16	0.05	-1	0.76	**1**	**0.75**	0.28	**0.82**
Ages 24-25 (5%)	0.19	0.07	-1	0.78	1	0.77	0.25	0.8
Ages 26-27 (6%)	0.6	0.51	-0.91	0.98	0.91	0.97	-0.21	0.45
Ages 28-29 (5%)	0.08	-0.03	-0.99	0.71	0.99	0.69	0.35	0.86
Ages 30-39 (10%)	0.63	0.54	-0.9	0.98	**0.9**	**0.98**	-0.24	0.42
Ages 40-49 (6%)	0.63	0.53	-0.9	0.98	0.9	0.98	-0.24	0.42
Ages 50-68 (2%)	0.61	0.52	-0.91	0.98	0.91	0.97	-0.22	0.44

Note. We bolded Age Groups and Symptoms whose contributions were equal to or larger than the average contribution in the difference 2-D map and boxed around correlations between those age groups and symptoms (but we included the correlation larger than +0.6 for further investigation). Ma = presence of major depressive disorder; Dy = dysthymia; De = depression not otherwise specified; Po = post traumatic stress disorder; Ob = obsessive compulsive disorder; Ge = generalized anxiety disorder; An = anxiety disorder not otherwise specified; and So = social phobia.