English Nominal Recursion Study, Part 1: General description of the data

1. General description of the data
2. Condition (ABCE) by Group (Adult-Child): Response is AllTargets
3. Trying to test the interaction of Adult-Child by item (Item is fixed)
4. Condition by Agegroup, DV is AllTargets: Limit the analysis to just kids
5. Trying to do better with Item nested within Condition, kids only.
   Fixed, then random.

```
> rm(list=ls()); options(scipen=999) # To avoid scientific notation
> # Install packages if necessary. Only need to do this once.
> # install.packages("lme4")
> # install.packages("car")
> # Load packages -- do this every time
> library(lme4) # For lmer function
Loading required package: Matrix
> library(car)  # For F-tests with p-values, Wald chi-squared tests
>
> # Read data into a data frame
> rdata =
read.table("http://www.utstat.toronto.edu/~brunner/workshops/mixed/Recursion.data.txt",
header=T)
> head(rdata,30)
```

	Participant	AgeinMonths	Group	Agegroup	Condition	Item	StrictTarget	AllTargets	Years	Months	Days	KABC_Hand
1	1	48.5	Child	4yos	A	a1a	1	1	4	0	14	4
2	1	48.5	Child	4yos	A	a1b	0	0	4	0	14	4
3	1	48.5	Child	4yos	A	a2	0	0	4	0	14	4
4	1	48.5	Child	4yos	A	a3	0	0	4	0	14	4
5	1	48.5	Child	4yos	A	a4	0	0	4	0	14	4
6	1	48.5	Child	4yos	A	a5	NA	NA	4	0	14	4
7	1	48.5	Child	4yos	A	a6	0	0	4	0	14	4
8	1	48.5	Child	4yos	B	b1	1	1	4	0	14	4
9	1	48.5	Child	4yos	B	b2	0	0	4	0	14	4
10	1	48.5	Child	4yos	B	b3	1	1	4	0	14	4
11	1	48.5	Child	4yos	B	b4	0	0	4	0	14	4
12	1	48.5	Child	4yos	B	b5	0	0	4	0	14	4
13	1	48.5	Child	4yos	B	b6	0	0	4	0	14	4
14	1	48.5	Child	4yos	C	c1	0	0	4	0	14	4
15	1	48.5	Child	4yos	C	c2	0	0	4	0	14	4
16	1	48.5	Child	4yos	C	c3	0	0	4	0	14	4
17	1	48.5	Child	4yos	C	c4	0	0	4	0	14	4
18	1	48.5	Child	4yos	C	c5	0	0	4	0	14	4
19	1	48.5	Child	4yos	C	c6	0	0	4	0	14	4
20	1	48.5	Child	4yos	E	e1	0	0	4	0	14	4
21	1	48.5	Child	4yos	E	e2	0	0	4	0	14	4
22	1	48.5	Child	4yos	E	e3	NA	NA	4	0	14	4
23	1	48.5	Child	4yos	E	e4	0	0	4	0	14	4
24	1	48.5	Child	4yos	E	e5	0	0	4	0	14	4
25	1	48.5	Child	4yos	E	e6	0	0	4	0	14	4
26	2	63.9	Child	5yos	A	a1a	1	1	5	3	27	7
27	2	63.9	Child	5yos	A	a1b	1	1	5	3	27	7
28	2	63.9	Child	5yos	A	a2	1	1	5	3	27	7
29	2	63.9	Child	5yos	A	a3	0	0	5	3	27	7
30	2	63.9	Child	5yos	A	a4	0	0	5	3	27	7

	CELF_SS	CELF_WS	CELF_EV	CELF_Sent	PPVT	KBIT
1	16	13	22	21	92	NA
2	16	13	22	21	92	NA
3	16	13	22	21	92	NA
4	16	13	22	21	92	NA
5	16	13	22	21	92	NA
6	16	13	22	21	92	NA
7	16	13	22	21	92	NA
8	16	13	22	21	92	NA

```
9       16      13      22        21   92   NA
10      16      13      22        21   92   NA
11      16      13      22        21   92   NA
12      16      13      22        21   92   NA
13      16      13      22        21   92   NA
14      16      13      22        21   92   NA
15      16      13      22        21   92   NA
16      16      13      22        21   92   NA
17      16      13      22        21   92   NA
18      16      13      22        21   92   NA
19      16      13      22        21   92   NA
20      16      13      22        21   92   NA
21      16      13      22        21   92   NA
22      16      13      22        21   92   NA
23      16      13      22        21   92   NA
24      16      13      22        21   92   NA
25      16      13      22        21   92   NA
26      19      22      29        34   96   NA
27      19      22      29        34   96   NA
28      19      22      29        34   96   NA
29      19      22      29        34   96   NA
30      19      22      29        34   96   NA
```

```
> summary(rdata)
  Participant      AgeinMonths      Group        Agegroup   Condition      Item        StrictTarget
 Min.   :  1.00   Min.   :48.50   Adult: 325   4yos :625   A:588     a1a    :  84   Min.   :0.0000
 1st Qu.: 23.75   1st Qu.:56.00   Child:1775   5yos :625   B:504     a1b    :  84   1st Qu.:0.0000
 Median : 45.50   Median :63.00                6yos :525   C:504     a2     :  84   Median :0.0000
 Mean   :111.20   Mean   :64.62                Adult:325   E:504     a3     :  84   Mean   :0.1467
 3rd Qu.:159.75   3rd Qu.:75.00                                      a4     :  84   3rd Qu.:0.0000
 Max.   :324.00   Max.   :83.00                                      a5     :  84   Max.   :1.0000
                  NA's   :325                                        (Other):1596   NA's   :8
   AllTargets         Years           Months           Days          KABC_Hand        CELF_SS
 Min.   :0.0000   Min.   :4.000   Min.   : 0.000   Min.   : 0.000   Min.   : 3.000   Min.   : 9.00
 1st Qu.:0.0000   1st Qu.:4.000   1st Qu.: 3.000   1st Qu.: 0.000   1st Qu.: 5.000   1st Qu.:15.00
 Median :0.0000   Median :5.000   Median : 4.000   Median : 7.000   Median : 6.000   Median :19.00
 Mean   :0.2424   Mean   :4.944   Mean   : 4.972   Mean   : 8.958   Mean   : 6.901   Mean   :17.63
 3rd Qu.:0.0000   3rd Qu.:6.000   3rd Qu.: 7.000   3rd Qu.:16.000   3rd Qu.: 8.000   3rd Qu.:20.00
 Max.   :1.0000   Max.   :6.000   Max.   :11.000   Max.   :28.000   Max.   :16.000   Max.   :22.00
 NA's   :8        NA's   :325     NA's   :325      NA's   :325      NA's   :325      NA's   :325
    CELF_WS         CELF_EV         CELF_Sent          PPVT            KBIT
 Min.   : 9.00   Min.   :10.00   Min.   : 2.00   Min.   : 56.0   Min.   :15.00
 1st Qu.:17.00   1st Qu.:26.00   1st Qu.:20.00   1st Qu.: 96.0   1st Qu.:18.00
 Median :19.00   Median :30.00   Median :26.00   Median :107.0   Median :20.00
 Mean   :18.55   Mean   :29.07   Mean   :24.93   Mean   :107.8   Mean   :20.65
 3rd Qu.:21.00   3rd Qu.:34.00   3rd Qu.:32.00   3rd Qu.:122.0   3rd Qu.:24.00
 Max.   :24.00   Max.   :40.00   Max.   :40.00   Max.   :146.0   Max.   :29.00
 NA's   :325     NA's   :325     NA's   :325     NA's   :325     NA's   :1600
```

```
> attach(rdata)
> table(Item,Condition) # Item is nested within condition.
     Condition
Item   A  B  C  E
  a1a 84  0  0  0
  a1b 84  0  0  0
  a2  84  0  0  0
  a3  84  0  0  0
  a4  84  0  0  0
  a5  84  0  0  0
  a6  84  0  0  0
  b1   0 84  0  0
  b2   0 84  0  0
  b3   0 84  0  0
  b4   0 84  0  0
  b5   0 84  0  0
  b6   0 84  0  0
  c1   0  0 84  0
  c2   0  0 84  0
  c3   0  0 84  0
  c4   0  0 84  0
  c5   0  0 84  0
  c6   0  0 84  0
  e1   0  0  0 84
  e2   0  0  0 84
  e3   0  0  0 84
  e4   0  0  0 84
  e5   0  0  0 84
  e6   0  0  0 84
> table(Participant,Condition)
           Condition
Participant A B C E
        1   7 6 6 6
        2   7 6 6 6
        4   7 6 6 6
        5   7 6 6 6
        6   7 6 6 6
        7   7 6 6 6
        8   7 6 6 6
        9   7 6 6 6

            ...

        319 7 6 6 6
        320 7 6 6 6
        321 7 6 6 6
        322 7 6 6 6
        323 7 6 6 6
        324 7 6 6 6

> table(StrictTarget, AllTargets) # AllTargets does include StrictTarget.
            AllTargets
StrictTarget    0    1
           0 1585  200
           1    0  307
```

```
> table(AllTargets,Item,Group)
, , Group = Adult

          Item
AllTargets a1a a1b a2 a3 a4 a5 a6 b1 b2 b3 b4 b5 b6 c1 c2 c3 c4 c5 c6 e1 e2 e3 e4 e5 e6
         0   1   1  3  2  7  6  5  3  6  3  5  3  2 12  7  8 10  7  3  9  9 10  7 10 13
         1  12  11 10 11  6  7  8 10  7 10  8 10 11  1  6  5  3  6 10  4  4  2  6  3  0

, , Group = Child

          Item
AllTargets a1a a1b a2 a3 a4 a5 a6 b1 b2 b3 b4 b5 b6 c1 c2 c3 c4 c5 c6 e1 e2 e3 e4 e5 e6
         0  27  46 62 61 67 46 53 37 63 47 60 37 55 67 59 66 64 55 65 71 63 56 66 69 71
         1  44  25  9  9  4 23 16 34  8 24 11 34 16  4 12  5  7 16  6  0  8 14  5  2  0

> # Note e6 has no yes responses,
> #      e1 has no yes responses for children,
> table(StrictTarget,Item,Group)
, , Group = Adult

            Item
StrictTarget a1a a1b a2 a3 a4 a5 a6 b1 b2 b3 b4 b5 b6 c1 c2 c3 c4 c5 c6 e1 e2 e3 e4 e5 e6
           0   4   1  4  2  8  9  7  8 10  8  8  8  7 13 10  9 12 12  5 11  9 11 11 12 13
           1   9  11  9 11  5  4  6  5  3  5  5  5  6  0  3  4  1  1  8  2  4  1  2  1  0

, , Group = Child

            Item
StrictTarget a1a a1b a2 a3 a4 a5 a6 b1 b2 b3 b4 b5 b6 c1 c2 c3 c4 c5 c6 e1 e2 e3 e4 e5 e6
           0  33  49 62 65 68 47 56 57 69 62 71 54 64 69 64 68 67 63 67 71 67 69 70 70 71
           1  38  22  9  5  3 22 13 14  2  9  0 17  7  2  7  3  4  8  4  0  4  1  1  1  0
```