Helmert Contrast Codes

- Helmert contrast codes provide a convention for constructing an orthogonal set of contrast codes in the absence of any specifically motivated comparisons

FIGURE 8.9 Helmert contrast codes

	Category level						
Code	*1*	*2*	*3*	…	*m–2*	*m–1*	*m*
λ_{1k}	m–1	–1	–1	…	–1	–1	–1
λ_{2k}	0	m–2	–1	…	–1	–1	–1
λ_{3k}	0	0	m–3	…	–1	–1	–1
⋮	⋮	⋮	⋮	…	⋮	⋮	⋮
λ_{m-2k}	0	0	0	…	2	–1	–1
λ_{m-1k}	0	0	0	…	0	1	–1

- Each row (λ) is a contrast code
- *m* represents the number of levels of the categorical predictor

Example of Helmert Contrast Codes

- **Example with a Categorical Predictor with 4 levels (m = 4):**

FIGURE 8.8 Codes for a four-level categorical predictor

	Level 1	*Level 2*	*Level 3*	*Level 4*
λ_{1k}	−3	1	1	1
λ_{2k}	0	−2	1	1
λ_{3k}	0	0	−1	1

Using Helmert Contrast Codes in R

- You can assign helmert contrast codes to a categorical predictor variable using the **contr.helmert(n = *m*)** function
  - Replace *m* with the number of levels of the categorical predictor

```
> levels(data_long$activity_type)
[1] "Running"  "Soccer"   "Swimming" "Yoga"
```

```
contrasts(data_long$activity_type) <- contr.helmert(n=4)
```

```
> contrasts(data_long$activity_type)
         [,1] [,2] [,3]
Running    -1   -1   -1
Soccer      1   -1   -1
Swimming    0    2   -1
Yoga        0    0    3
```