21)

	No Therapy	Group Therapy	Individual Therapy	
Back w/in 1yr	24	10	41	75
Back w/in 1yr-10yrs	25	13	32	70
Never Back	12	20	9	41
TOTAL	61	43	82	186

Test to ✓ for independence b/w therapy and rearrest

$H_0: \pi_{ij} = \pi_{i\cdot}\,\pi_{j\cdot}$ $\quad i = 1,2,3$ $\quad j = 1,2,3$

H_a at least one eqn is not valid

Calculate expected values, $\hat{e}_{ij}$

	None	Group	Individual	
Back 1yr	25.596	17.33	33.065	$\pi_{1\cdot} = 75/186$
Back 1-10yrs	22.9519	16.1827	30.8602	$\pi_{2\cdot} = 70/186$
Never	13.446	9.4785	18.07	$\pi_{3\cdot} = 41/186$
	$\pi_{\cdot 1} = \frac{61}{186}$	$\pi_{\cdot 2} = \frac{43}{186}$	$\pi_{\cdot 3} = \frac{82}{186}$	

$$T = \sum^{3}\sum^{3} \frac{(O_{ij} - \hat{e}_{ij})^2}{\hat{e}_{ij}} \sim \chi^2_{(3-1)(3-1)}$$

$T = 22.266641$

$\chi^2_4 = 13.4$

p-value $1.773 \times 10^{-4} < 0.05$

Reject H_0. Not independent between, so ∃ some treatment that makes different

Analyzing data, group therapy appears to be different than combined no therapy and individual therapy

$H_0: \pi_{ij} = \pi_{i\cdot}\,\pi_{\cdot j}$ $\quad i = 1, 2, 3$ $\quad j = 1, 2$

H_a at least one eqn is not valid

	None / individual	Group	
Back in 1yr	65 (57.66)	10 (17.33)	$\pi_{1\cdot} = 75/186$
Back in 1yr–10yr	57 (53.817)	13 (16.1827)	$\pi_{2\cdot} = 70/186$
Never	21 (31.52)	20 (9.47)	$\pi_{3\cdot} = 41/186$
	$\pi_{\cdot 1} = \frac{143}{186}$	$\pi_{\cdot 2} = \frac{43}{186}$	

$$T = \sum_{i=1}^{3}\sum_{j=1}^{2} \frac{(O_{ij} - \hat{e}_{ij})^2}{\hat{e}_{ij}} \qquad \chi^2_{(2-1)(3-1)}$$

$T = 20.0456 \rightarrow$ p-value

$\chi^2_2\,(20.0456) < 0.001 < 0.05$

Reject H_0 Not independent

Compare No Therapy v/ Individual therapy

$H_0: \pi_{ij} = \pi_{i\cdot}\,\pi_{\cdot j} \quad i = 1,2,3 \quad j = 1,2$

H_a at least one eqn is not valid

	NONE	INDIND	
Back in 1yr	24 (27.73)	41 (37.27)	$\pi_{1\cdot} = 65/143$
Back in 1y-10y	25 (24.31)	32 (32.69)	$\pi_{2\cdot} = 57/143$
Never	12 (8.96)	9 (12.04)	$\pi_{3\cdot} = 21/143$
	$\pi_{\cdot 1} = 61/143$	$\pi_{\cdot 2} = 82/143$	

$$T = \sum_{i}^{3}\sum_{j}^{2} \frac{(O_{ij} - \hat{e}_{ij})^2}{\hat{e}_{ij}} \sim \chi^2_{(2-1)(3-1)}$$

$T = 2.71 \qquad \chi^2_2(2.77) = 0.25 > 0.05$

Cannot reject H_0 · they are independent

from observations, group therapy made an effect

on how likely they were to go back to prison.