

# Twin Studies on Smoking

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```
library(magrittr)
library(tidyverse)
# par(mfrow = c(1, 2))
#> 제시된 표와 닮은 행렬 생성
Nature1 <- matrix(c(1, 1, 1, 3, 1, 9),
                  nrow = 3, byrow = TRUE)
rownames(Nature1) <- c("1990", "2000", "2010")
colnames(Nature1) <- c("시골", "서울")
Nature1
```

```
##      시골 서울
## 1990    1    1
## 2000    1    3
## 2010    1    9
```

```
Nature1 %>%
  barplot
```

## 행렬 구조와 barplot

```
## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <ec>
```

```
## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <8b>
```

```
## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <9c>
```

```

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <ea>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <b3>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <a8>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <ec>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <8b>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
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## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '시골' in 'mbcsToSbcs': dot substituted for
## <ea>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
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## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
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## <a8>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <ec>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <84>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for

```

```
## <9c>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <ec>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <9a>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <b8>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <ec>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <84>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <9c>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
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## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
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## <9a>

## Warning in axis(if (horiz) 2 else 1, at = at.l, labels = names.arg, lty =
## axis.lty, : conversion failure on '서울' in 'mbcsToSbcs': dot substituted for
## <b8>
```

```
Nature1 %>%
  t %>%
  barplot
```

```
# par(mfrow = c(1, 1))
```

Nature1의 구조를 전치(transpose)해 주어야 원하는 모양의 막대그래프가 나올 것임을 알 수 있다. 나머지 이러한 점을 염두에 두고 작성한다.

## Stack

```
options(digits = 3)
#> RColorBrewer 패키지를 이용하여 컬러 생성
library(RColorBrewer)
#> "Accent" palette 채택
cols <- brewer.pal(8, "Accent")
#> 막대의 가운데에 추가 정보를 넣기 위한 좌표 설정 함수.
# pos <- function(x){
#   cumsum(x) - x / 2
# }
pos <- . %>% {`-`(cumsum(.), . / 2)}
# pos <- . %>% {cumsum(.) - . / 2}
#> 아래와 같이 작성하면 오류 발생
# pos <- . %>% cumsum(.) - . / 2
#> 텍스트 정보 넣을 좌표를 계산한다.
y1_text <- apply(Nature1,
                  MARGIN = 1,
                  FUN = pos)
```

```
# par(family = "KoPubWorldDotum Medium")
```

```
b1 <- Nature1 %>%
```

```
  t %>%
```

```
  barplot(width = 0.8,
          xlim = c(0, 5),
          space = 1,
          col = cols[1:2],
          yaxt = "n")
```

#> 쌍둥이유형 별로 한 막대에 흡연습관의 닮음 정도를 나타낼 것이므로 `cumsum` 함수를 이용하여 막대들이 위치할 좌표.

#> `format` 함수의 용법에 익숙해지고, `las = 2`가 왜 필요한지 여러 경우를 비교하라.

```
axis(side = 2,
     at = c(0, apply(t(Nature1),
                     MARGIN = 2,
                     FUN = cumsum)),
     labels = format(c(0, apply(t(Nature1),
                               MARGIN = 2,
                               FUN = cumsum)),
                     digits = 3,
                     nsmall = 0),
     las = 2)
mtext(text = "단위(억원)", side = 2, at = 11, las = 2)
```

```
## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <eb>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <8b>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <a8>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <ec>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <9c>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <84>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <ec>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <96>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <b5>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <ec>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <9b>

## Warning in mtext(text = "단위(억원)", side = 2, at = 11, las = 2): conversion
## failure on '단위(억원)' in 'mbcsToSbcs': dot substituted for <90>
```

*#> 막대그래프 작성 과정에서 나온 막대의 좌표와 `pos`함수로 계산한 y좌표를 이용하여 실제 관찰된 쌍둥이 페어의 수효*

```
text(x = rep(b1, each = 2),
     y = y1_text,
     labels = paste0(t(Nature1), "억"))
```

```
## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <ec>
```

```
## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
```

```

## substituted for <96>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : font metrics unknown for Unicode character U+c5b5

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <ec>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <96>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
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## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <ec>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <96>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : font metrics unknown for Unicode character U+c5b5

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '3억' in 'mbcsToSbcs': dot
## substituted for <ec>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '3억' in 'mbcsToSbcs': dot
## substituted for <96>

```

```
## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '3억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : font metrics unknown for Unicode character U+c5b5

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <ec>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <96>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '1억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : font metrics unknown for Unicode character U+c5b5

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '9억' in 'mbcsToSbcs': dot
## substituted for <ec>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '9억' in 'mbcsToSbcs': dot
## substituted for <96>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : conversion failure on '9억' in 'mbcsToSbcs': dot
## substituted for <b5>

## Warning in text.default(x = rep(b1, each = 2), y = y1_text, labels =
## paste0(t(Nature1), : font metrics unknown for Unicode character U+c5b5
```

```
#> 범례 표시
```

```
legend("topleft",
      inset = 0.01,
      fill = cols[2:1],
      legend = rev(colnames(Nature1)),
      bty = "n")
```

```
## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <ec>
```

```

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <84>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <9c>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <ec>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <9a>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '서울' in 'mbcsToSbcs': dot substituted for <b8>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <ec>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <8b>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <9c>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <ea>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <b3>

## Warning in strwidth(legend, units = "user", cex = cex, font = text.font):
## conversion failure on '시골' in 'mbcsToSbcs': dot substituted for <a8>

## Warning in text.default(x, y, ...): conversion failure on '서울' in
## 'mbcsToSbcs': dot substituted for <ec>

## Warning in text.default(x, y, ...): conversion failure on '서울' in
## 'mbcsToSbcs': dot substituted for <84>

## Warning in text.default(x, y, ...): conversion failure on '서울' in
## 'mbcsToSbcs': dot substituted for <9c>

## Warning in text.default(x, y, ...): conversion failure on '서울' in
## 'mbcsToSbcs': dot substituted for <ec>

## Warning in text.default(x, y, ...): conversion failure on '서울' in
## 'mbcsToSbcs': dot substituted for <9a>

## Warning in text.default(x, y, ...): conversion failure on '서울' in

```



```
## 'mbcsToSbcs': dot substituted for <b8>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <ec>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <8b>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <9c>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <ea>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <b3>

## Warning in text.default(x, y, ...): conversion failure on '시골' in
## 'mbcsToSbcs': dot substituted for <a8>
```

```
#> 메인 타이틀
```

```
title(main = "불균형 성장과 양극화",
      cex.main = 1.5)
```

```
## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <eb>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <b6>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <88>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <ea>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <b7>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <a0>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <ed>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <98>
```

[illegible]

```
## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <ed>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <99>

## Warning in title(main = "불균형 성장과 양극화", cex.main = 1.5): conversion
## failure on '불균형 성장과 양극화' in 'mbcsToSbcs': dot substituted for <94>
```