

Supplementary Table 1 Baseline demographic characteristics of probationers (n=297)

| | All | CAU | BI | CI | |
|-----------------------------------|------------|-----------|-----------|-----------|---------|
| | n =297 | n = 99 | n = 102 | n = 96 | p-value |
| | N (%) | n (%) | n (%) | n (%) | |
| Sex | | | | | |
| Male | 143 (51.1) | 52 (55.3) | 46 (47.9) | 45 (50.0) | 0.58 |
| Female | 137 (48.9) | 42 (44.7) | 50 (52.1) | 45 (50.0) | |
| Age | | | | | |
| 12-19 | 44 (15.1) | 21 (21.2) | 12 (12.1) | 11 (11.7) | 0.45 |
| 20-39 | 136 (46.6) | 43 (43.4) | 47 (47.5) | 46 (48.9) | |
| 40-59 | 81 (27.7) | 23 (23.2) | 31 (31.3) | 27 (28.7) | |
| ≥60 | 31 (10.6) | 12 (12.1) | 9 (9.1) | 10 (10.6) | |
| Marital status^b | | | | | |
| Not married | 154 (52.9) | 57 (57.6) | 46 (46.5) | 51 (54.8) | 0.37 |
| Married | 101 (34.7) | 33 (33.3) | 40 (40.4) | 28 (30.1) | |
| Separated, divorced, widowed | 36 (12.1) | 9 (9.1) | 13 (13.1) | 14 (15.1) | |
| Education^c | | | | | |
| Primary or below | 40 (13.7) | 12 (12.2) | 13 (13.1) | 15 (16.0) | 0.78 |
| Secondary | 195 (67.0) | 70 (71.4) | 66 (66.7) | 59 (62.8) | |
| Post-secondary or above | 56 (19.2) | 16 (16.3) | 20 (20.2) | 20 (21.3) | |
| Employment^d | | | | | |
| Student | 24 (8.4) | 14 (14.4) | 5 (5.2) | 5 (5.4) | 0.12 |
| Employed full-time/part-time | 186 (65.0) | 63 (64.9) | 63 (65.6) | 60 (64.5) | |
| Unemployed/retired | 27 (9.4) | 9 (9.3) | 8 (8.3) | 10 (10.8) | |
| Homemaker | 41 (14.3) | 9 (9.3) | 15 (15.6) | 17 (18.3) | |
| Duration of probation | | | | | |
| Half year or below | 191 (66.6) | 63 (64.9) | 71 (72.4) | 57 (62.0) | 0.15 |
| Half year to 1 year | 74 (25.8) | 22 (22.7) | 24 (24.5) | 28 (30.4) | |
| 1 year to 1.5 years | 20 (7.0) | 10 (10.3) | 3 (3.1) | 7 (7.6) | |
| >1.5 years | 2 (0.7) | 2 (2.1) | 0 (0.0) | 0 (0.0) | |

CAU= Care-as-usual group, BI = Brief intervention group, CI = Combined intervention group

^ap-value for the differences among 3 groups at baseline

^b 6 missing value, n=291; ^c 6 missing value, n=291; ^d 19 missing value, n=278

Supplementary Table 2 The within-group difference in physical activity, fitness performances, psychological well-being and quality of life at 1- and 3-month follow-up in 3 groups: Complete-case analysis

| | CAU (n=99) | | BI (n=102) | | CI (n=96) | |
|--|-------------------------------|----------------|-------------------------------|----------------|------------------------------|----------------|
| | Mean \pm SD | Cohen's d | Mean \pm SD | Cohen's d | Mean \pm SD | Cohen's d |
| Physical activity | | | | | | |
| Days spent engaging in physical activity while seated | | | | | | |
| T1 | 1.9 \pm 2.4 [#] | | 2.5 \pm 2.6 [#] | | 2.2 \pm 2.6 [#] | |
| T2, (T2 vs T1) | 2.6 \pm 2.7 | 0.26** | 2.9 \pm 2.4 | 0.16 | 2.9 \pm 2.4 | 0.29* |
| T3, (T3 vs T1) | 2.4 \pm 2.4 | 0.19* | 3.3 \pm 2.5 | 0.32** | 2.8 \pm 2.5 | 0.26* |
| Days spent engaging in physical activity while standing | | | | | | |
| T1 | 2.2 \pm 2.5 | | 2.5 \pm 2.6 [#] | | 2.3 \pm 2.6 ^{###} | |
| T2, (T2 vs T1) | 2.3 \pm 2.5 | 0.04 | 3.0 \pm 2.5 | 0.19 | 3.2 \pm 2.5 | 0.37*** |
| T3, (T3 vs T1) | 2.4 \pm 2.4 | 0.10 | 3.3 \pm 2.5 | 0.32* | 3.1 \pm 2.5 | 0.33** |
| Days spent engaging in moderate physical activity | | | | | | |
| T1 | 2.3 \pm 2.5 | | 2.5 \pm 2.6 | | 1.9 \pm 2.2 ^{###} | |
| T2, (T2 vs T1) | 2.1 \pm 2.4 | -0.08 | 2.3 \pm 2.4 | -0.09 | 3.1 \pm 2.4 | 0.52*** |
| T3, (T3 vs T1) | 2.4 \pm 2.5 | 0.04 | 2.2 \pm 2.2 | -0.15 | 2.8 \pm 2.3 | 0.38*** |
| Days spent engaging in vigorous physical activity | | | | | | |
| T1 | 1.3 \pm 1.9 | | 1.4 \pm 1.9 | | 1.1 \pm 1.6 [#] | |
| T2, (T2 vs T1) | 1.2 \pm 1.8 | -0.06 | 1.6 \pm 2.0 | 0.11 | 1.6 \pm 1.9 | 0.33** |
| T3, (T3 vs T1) | 1.1 \pm 1.5 | -0.11 | 1.6 \pm 2.0 | 0.10 | 1.5 \pm 1.8 | 0.23* |
| Physical fitness | | | | | | |
| Single-leg stand test, seconds | | | | | | |
| T1 | 86.0 \pm 39.9 | | 91.4 \pm 40.3 | | 84.2 \pm 39.8 | |
| T2, (T2 vs T1) | 85.4 \pm 38.0 | -0.02 | 90.4 \pm 38.0 | -0.02 | 84.1 \pm 38.9 | 0.00 |
| T3, (T3 vs T1) | 84.5 \pm 38.3 | -0.04 | 90.7 \pm 38.2 | -0.04 | 82.7 \pm 39.9 | -0.01 |
| 30-s chair stand test, number of stands | | | | | | |
| T1 | 19.0 \pm 7.7 ^{###} | | 18.6 \pm 7.7 ^{###} | | 22.0 \pm 9.0 [#] | |
| T2, (T2 vs T1) | 21.0 \pm 9.1 | 0.24*** | 21.3 \pm 8.2 | 0.33*** | 23.3 \pm 9.8 | 0.13* |
| T3, (T3 vs T1) | 21.9 \pm 9.2 | 0.34*** | 21.8 \pm 8.5 | 0.39*** | 23.0 \pm 8.7 | 0.12* |
| Psychological well-being | | | | | | |
| Self-esteem | | | | | | |
| T1 | 27.0 \pm 4.6 | | 27.0 \pm 3.6 [#] | | 27.8 \pm 4.1 | |
| T2, (T2 vs T1) | 27.3 \pm 4.6 | 0.08 | 27.6 \pm 3.5 | 0.16** | 27.8 \pm 4.6 | 0.00 |
| T3, (T3 vs T1) | 27.1 \pm 4.9 | 0.02 | 27.6 \pm 3.7 | 0.14 | 27.9 \pm 4.2 | 0.01 |
| Subjective happiness | | | | | | |
| T1 | 17.1 \pm 4.8 | | 17.6 \pm 4.1 ^{###} | | 17.7 \pm 4.8 | |
| T2, (T2 vs T1) | 17.6 \pm 4.7 | 0.11 | 17.9 \pm 4.0 | 0.07 | 18.1 \pm 4.2 | 0.10 |
| T3, (T3 vs T1) | 17.7 \pm 4.2 | 0.15 | 18.8 \pm 4.1 | 0.31*** | 18.1 \pm 4.3 | 0.10 |
| Anxiety and depression | | | | | | |
| T1 | 2.4 \pm 2.6 | | 3.0 \pm 2.9 | | 3.0 \pm 3.1 [#] | |
| T2, (T2 vs T1) | 2.6 \pm 3.0 | 0.08 | 2.7 \pm 3.0 | -0.07 | 2.2 \pm 2.3 | -0.29** |
| T3, (T3 vs T1) | 2.4 \pm 2.6 | 0.03 | 2.7 \pm 2.9 | -0.10 | 2.4 \pm 2.6 | -0.21* |
| Life satisfaction | | | | | | |
| T1 | 20.9 \pm 7.3 | | 21.9 \pm 7.1 | | 21.8 \pm 6.9 | |
| T2, (T2 vs T1) | 21.7 \pm 7.4 | 0.10 | 21.9 \pm 6.5 | 0.00 | 23.1 \pm 6.7 | 0.19* |
| T3, (T3 vs T1) | 21.8 \pm 7.3 | 0.12 | 22.9 \pm 6.1 | 0.15 | 23.1 \pm 6.8 | 0.20 |
| Quality of life | | | | | | |
| Physical quality of life | | | | | | |
| T1 | 47.4 \pm 8.8 | | 47.6 \pm 8.4 | | 46.5 \pm 8.8 | |
| T2, (T2 vs T1) | 46.9 \pm 8.4 | -0.05 | 47.9 \pm 8.6 | 0.04 | 47.5 \pm 8.0 | 0.12 |
| T3, (T3 vs T1) | 48.2 \pm 7.9 | 0.10 | 47.4 \pm 8.1 | -0.02 | 47.0 \pm 8.2 | 0.06 |
| Mental quality of life | | | | | | |
| T1 | 44.5 \pm 9.8 [#] | | 44.2 \pm 8.4 | | 45.1 \pm 9.0 | |
| T2, (T2 vs T1) | 46.8 \pm 10.1 | 0.23** | 45.1 \pm 9.3 | 0.11 | 47.0 \pm 9.1 | 0.22* |
| T3, (T3 vs T1) | 45.5 \pm 10.3 | 0.10 | 45.2 \pm 8.9 | 0.12 | 45.9 \pm 8.7 | 0.09 |

T1 = baseline, T2 = 1 month, T3 = 3 months

Repeated Measures Analysis of Variance and paired t-test to compare parametric data among three timepoints and between two timepoints, respectively.

T2 vs T1 = values at 1 month versus values at baseline; T3 vs T1 = values at 3-months versus values at baseline

Difference among three timepoints: [#]p < .05, ^{##}p<0.01, ^{###}p<0.001; Difference between two timepoints: *p < 0.05, **p < 0.01, ***p < 0.001

Effect size (Cohen's d): small = 0.20, moderate = 0.50, and large = 0.80

Supplementary Table 3 The within-group difference in family well-being and relationship with probation officers at 1- and 3-month follow-up in 3 groups: Complete-case analysis

| | CAU (n=99) | | BI (n=102) | | CI (n=96) | |
|---|------------------------------|----------------|------------------------------|----------------|------------------------------|----------------|
| | Mean \pm SD | Cohen's d | Mean \pm SD | Cohen's d | Mean \pm SD | Cohen's d |
| Family communication | | | | | | |
| Did physical activity with family members, score | | | | | | |
| T1 | 1.7 \pm 0.9 ^{###} | | 1.8 \pm 1.0 ^{###} | | 1.8 \pm 0.9 ^{###} | |
| T2, (T2 vs T1) | 1.9 \pm 1.0 | 0.19* | 2.7 \pm 1.0 | 0.86*** | 2.6 \pm 1.0 | 0.84*** |
| T3, (T3 vs T1) | 2.1 \pm 1.0 | 0.40*** | 2.8 \pm 1.1 | 0.89*** | 2.6 \pm 0.9 | 0.79*** |
| Praised family members to do physical activity, score | | | | | | |
| T1 | 2.4 \pm 1.0 | | 2.3 \pm 1.0 ^{###} | | 2.6 \pm 1.1 ^{##} | |
| T2, (T2 vs T1) | 2.5 \pm 1.0 | 0.11 | 2.8 \pm 1.0 | 0.50*** | 2.9 \pm 0.9 | 0.36** |
| T3, (T3 vs T1) | 2.6 \pm 0.9 | 0.20* | 2.9 \pm 0.9 | 0.60*** | 3.0 \pm 1.0 | 0.39** |
| Discussing the importance of exercises with family, score | | | | | | |
| T1 | 2.7 \pm 1.2 | | 2.6 \pm 1.2 ^{###} | | 2.8 \pm 1.1 [#] | |
| T2, (T2 vs T1) | 2.7 \pm 1.1 | -0.04 | 2.9 \pm 1.0 | 0.26** | 3.0 \pm 1.0 | 0.21 |
| T3, (T3 vs T1) | 2.7 \pm 1.1 | -0.05 | 3.1 \pm 0.9 | 0.47*** | 3.2 \pm 1.0 | 0.32** |
| Expressed verbal appreciation to family members, score | | | | | | |
| T1 | 2.9 \pm 1.1 | | 3.0 \pm 1.1 [#] | | 3.0 \pm 1.0 ^{###} | |
| T2, (T2 vs T1) | 2.8 \pm 1.1 | -0.10 | 3.0 \pm 1.0 | 0.07 | 3.3 \pm 0.9 | 0.33** |
| T3, (T3 vs T1) | 2.9 \pm 1.0 | 0.03 | 3.2 \pm 0.9 | 0.27** | 3.4 \pm 1.0 | 0.42*** |
| Expressed appreciation through action to family members, score | | | | | | |
| T1 | 2.9 \pm 1.0 | | 3.1 \pm 1.1 | | 3.1 \pm 1.1 ^{##} | |
| T2, (T2 vs T1) | 2.9 \pm 1.0 | 0.01 | 3.1 \pm 0.9 | -0.04 | 3.4 \pm 1.0 | 0.30* |
| T3, (T3 vs T1) | 2.8 \pm 1.1 | -0.08 | 3.3 \pm 1.0 | 0.18 | 3.4 \pm 1.1 | 0.35** |
| Family well-being, score | | | | | | |
| T1 | 6.3 \pm 2.5 | | 6.5 \pm 2.5 | | 6.4 \pm 2.4 ^{##} | |
| T2, (T2 vs T1) | 6.1 \pm 2.6 | -0.10 | 6.7 \pm 2.5 | 0.06 | 7.2 \pm 2.3 | 0.33*** |
| T3, (T3 vs T1) | 6.0 \pm 2.8 | -0.11 | 6.9 \pm 2.4 | 0.16 | 6.9 \pm 2.4 | 0.22* |
| Relationship with probation officers, score | | | | | | |
| T1 | 4.3 \pm 0.7 | | 4.3 \pm 0.7 [#] | | 4.3 \pm 0.7 ^{##} | |
| T2, (T2 vs T1) | 4.3 \pm 0.7 | -0.03 | 4.4 \pm 0.6 | 0.09 | 4.5 \pm 0.6 | 0.18 |
| T3, (T3 vs T1) | 4.3 \pm 0.7 | -0.09 | 4.5 \pm 0.6 | 0.21* | 4.5 \pm 0.6 | 0.31** |

T1 = baseline, T2 = 1 month, T3 = 3 months

T2 vs T1 = values at 1-month versus values at baseline; T3 vs T1 = values at 3-months versus values at baseline

Repeated Measures Analysis of Variance and paired t-test to compare parametric data among three timepoints and between two timepoints, respectively. Difference among three timepoints: [#]p < .05, ^{##}p<0.01, ^{###}p<0.001; Difference between two timepoints: *p < 0.05, **p < 0.01, ***p < 0.001

Effect size (Cohen's d): small =0.02, moderate =0.50, large = 0.80.

Supplementary Table 4 The between-group difference in the changes in physical fitness, psychological well-being, and quality of life at 1- and 3-month follow-up in 3 groups: Complete case analysis

| | BI vs CAU | | CI vs CAU | | CI vs BI | |
|--|----------------------------|-----------|----------------------------|-----------|----------------------------|-----------|
| | Mean difference (95%CI) | Cohen's d | Mean difference (95%CI) | Cohen's d | Mean difference (95%CI) | Cohen's d |
| Difference in the changes at 1 month | | | | | | |
| Physical activity | | | | | | |
| Days spent engaging in Zero-time exercise while seated, days | 0.07 (-0.74, 0.87) | 0.03 | 0.18 (-0.63, 0.99) | 0.08 | 0.11 (-0.70, 0.92) | 0.05 |
| Days spent engaging in Zero-time exercise while standing, days | 0.62 (-0.15, 1.39) | 0.28 | 0.88 (0.10, 1.65) | 0.40* | 0.26 (-0.52, 1.03) | 0.12 |
| Days spent engaging in moderate physical activity, days | 0.18 (-0.54, 0.90) | 0.09 | 1.42 (0.70, 2.15) | 0.70*** | 1.25 (0.52, 1.98) | 0.62*** |
| Days spent engaging in vigorous physical activity, days | 0.39 (-0.21, 0.99) | 0.23 | 0.65 (0.05, 1.25) | 0.39* | 0.26 (-0.35, 0.86) | 0.15 |
| Physical fitness | | | | | | |
| Single-leg stand test, second | 1.49 (-7.73, 10.71) | 0.06 | 0.28 (-9.12, 9.69) | 0.01 | -1.21 (-10.61, 8.19) | -0.05 |
| 30-s chair stand test, no. of stand | 0.42 (-1.36, 2.20) | 0.08 | -0.71 (-2.56, 1.15) | -0.14 | -1.13 (-2.97, 0.72) | -0.22 |
| Psychological well-being | | | | | | |
| Self-esteem | 0.21 (-0.82, 1.24) | 0.07 | -0.18 (-1.23, 0.87) | -0.06 | -0.39 (-1.44, 0.66) | -0.13 |
| Subjective happiness | 0.06 (-1.01, 1.12) | 0.02 | 0.21 (-0.88, 1.30) | 0.07 | 0.15 (-0.93, 1.23) | 0.05 |
| Anxiety and depression | -0.23 (-1.07, 0.62) | -0.09 | -0.82 (-1.68, 0.04) | -0.35 | -0.60 (-1.45, 0.26) | -0.25 |
| Life satisfaction | -0.06 (-1.75, 1.63) | -0.01 | 0.95 (-0.77, 2.66) | 0.20 | 1.01 (-0.69, 2.71) | 0.21 |
| Quality of life | | | | | | |
| Physical quality of life | 0.86 (-1.24, 2.96) | 0.14 | 1.39 (-0.73, 3.52) | 0.24 | 0.54 (-1.61, 2.68) | 0.09 |
| Mental quality of life | -1.54 (-4.13, 1.06) | -0.21 | -0.26 (-2.90, 2.37) | -0.04 | 1.27 (-1.38, 3.92) | 0.17 |
| Family communication | | | | | | |
| Did physical activity with family members, score | 0.77 (0.45, 1.08) | 0.86*** | 0.71 (0.39, 1.03) | 0.79*** | -0.05 (-0.37, 0.26) | -0.06 |
| Praised family members to do physical activity, score | 0.37 (0.06, 0.68) | 0.42* | 0.40 (0.08, 0.71) | 0.45** | 0.03 (-0.29, 0.34) | 0.03 |
| Expressed verbal appreciation to family members, score | 0.22 (-0.08, 0.52) | 0.26 | 0.52 (0.22, 0.82) | 0.61*** | 0.30 (0.00, 0.60) | 0.35 |
| Expressed appreciation to family members through action, score | 0.12 (-0.19, 0.42) | 0.13 | 0.42 (0.11, 0.72) | 0.48** | 0.30 (-0.01, 0.61) | 0.35 |
| Family well-being | 0.61 (-0.02, 1.25) | 0.34 | 1.17 (0.53, 1.81) | 0.65*** | 0.56 (-0.09, 1.20) | 0.31 |
| Relationship with probation officers | 0.09 (-0.08, 0.26) | 0.19 | 0.12 (-0.05, 0.29) | 0.25 | 0.03 (-0.14, 0.20) | 0.06 |
| Difference in the changes at 3 months | | | | | | |
| Physical activity | | | | | | |
| Days spent engaging in Zero-time exercise while seated, days | 0.70 (-0.10, 1.50) | 0.31 | 0.34 (-0.46, 1.15) | 0.15 | -0.36 (-1.16, 0.44) | -0.16 |
| Days spent engaging in Zero-time exercise while standing, days | 0.75 (-0.03, 1.54) | 0.34 | 0.60 (-0.19, 1.40) | 0.27 | -0.15 (-0.95, 0.64) | -0.07 |
| Days spent engaging in moderate physical activity, days | -0.37 (-1.11, 0.38) | -0.18 | 0.66 (-0.09, 1.40) | 0.31 | 1.03 (0.27, 1.78) | 0.49** |
| Days spent engaging in vigorous physical activity, days | 0.46 (-0.11, 1.03) | 0.29 | 0.53 (-0.04, 1.10) | 0.33 | 0.07 (-0.50, 0.65) | 0.05 |
| Physical fitness | | | | | | |
| Single-leg stand test, second | 0.95 (-8.87, 10.76) | 0.03 | -0.15 (-10.12, 9.83) | -0.01 | -1.09 (-11.06, 8.87) | -0.04 |
| 30-s chair stand test, number of stand | 0.01 (-1.78, 1.79) | 0.00 | -1.54 (-3.39, 0.32) | -0.30 | -1.54 (-3.39, 0.31) | -0.30 |
| Psychological well-being | | | | | | |
| Self-esteem | 0.52 (-0.52, 1.55) | 0.18 | 0.28 (-0.78, 1.33) | 0.09 | -0.24 (-1.29, 0.81) | -0.08 |
| Subjective happiness | 0.77 (-0.33, 1.88) | 0.25 | 0.16 (-0.97, 1.29) | 0.05 | -0.61 (-1.73, 0.50) | -0.20 |
| Anxiety and depression | -0.10 (-0.92, 0.71) | -0.04 | -0.35 (-1.18, 0.48) | -0.15 | -0.24 (-1.07, 0.58) | -0.11 |
| Life satisfaction | 0.38 (-1.40, 2.16) | 0.07 | 0.95 (-0.86, 2.75) | 0.19 | 0.57 (-1.22, 2.36) | 0.11 |

| | | | | | | |
|--|---------------------|---------|---------------------|--------------|---------------------|-------|
| Quality of life | | | | | | |
| Physical quality of life | -0.32 (-2.55, 1.91) | -0.05 | 0.05 (-2.21, 2.31) | 0.01 | 0.37 (-1.91, 2.64) | 0.06 |
| Mental quality of life | -0.12 (-2.82, 2.58) | -0.02 | -0.19 (-2.93, 2.55) | -0.03 | -0.08 (-2.83, 2.68) | -0.01 |
| Family communication | | | | | | |
| Did physical activity with family members, score | 0.64 (0.29, 0.99) | 0.64*** | 0.44 (0.09, 0.80) | 0.45** | -0.20 (-0.55, 0.16) | -0.20 |
| Praised family members to do physical activity, score | 0.37 (0.05, 0.69) | 0.41* | 0.40 (0.08, 0.72) | 0.45** | 0.03 (-0.29, 0.35) | 0.04 |
| Expressed verbal appreciation to family members, score | 0.25 (-0.06, 0.56) | 0.29 | 0.48 (0.17, 0.80) | 0.55** | 0.23 (-0.09, 0.54) | 0.26 |
| Expressed appreciation to family members through action, score | 0.35 (0.02, 0.69) | 0.37* | 0.57 (0.23, 0.91) | 0.60*** | 0.22 (-0.12, 0.56) | 0.23 |
| Family well-being, score | 0.94 (0.20, 1.68) | 0.45** | 0.96 (0.21, 1.71) | 0.46** | 0.02 (-0.73, 0.78) | 0.01 |
| Relationship with probation officers | 0.16 (-0.01, 0.34) | 0.32 | 0.21 (0.03, 0.39) | 0.41* | 0.04 (-0.14, 0.22) | 0.09 |

CAU= Care-as-usual group, BI = Brief intervention group, CI = Combined intervention group

Linear mixed model was adopted to examine the between-group difference

Effect size (Cohen's d): small =0.02, moderate =0.50, large = 0.80; * p <0.01