

# Prevention of Adolescent Depression and the Potential Role of Exercise



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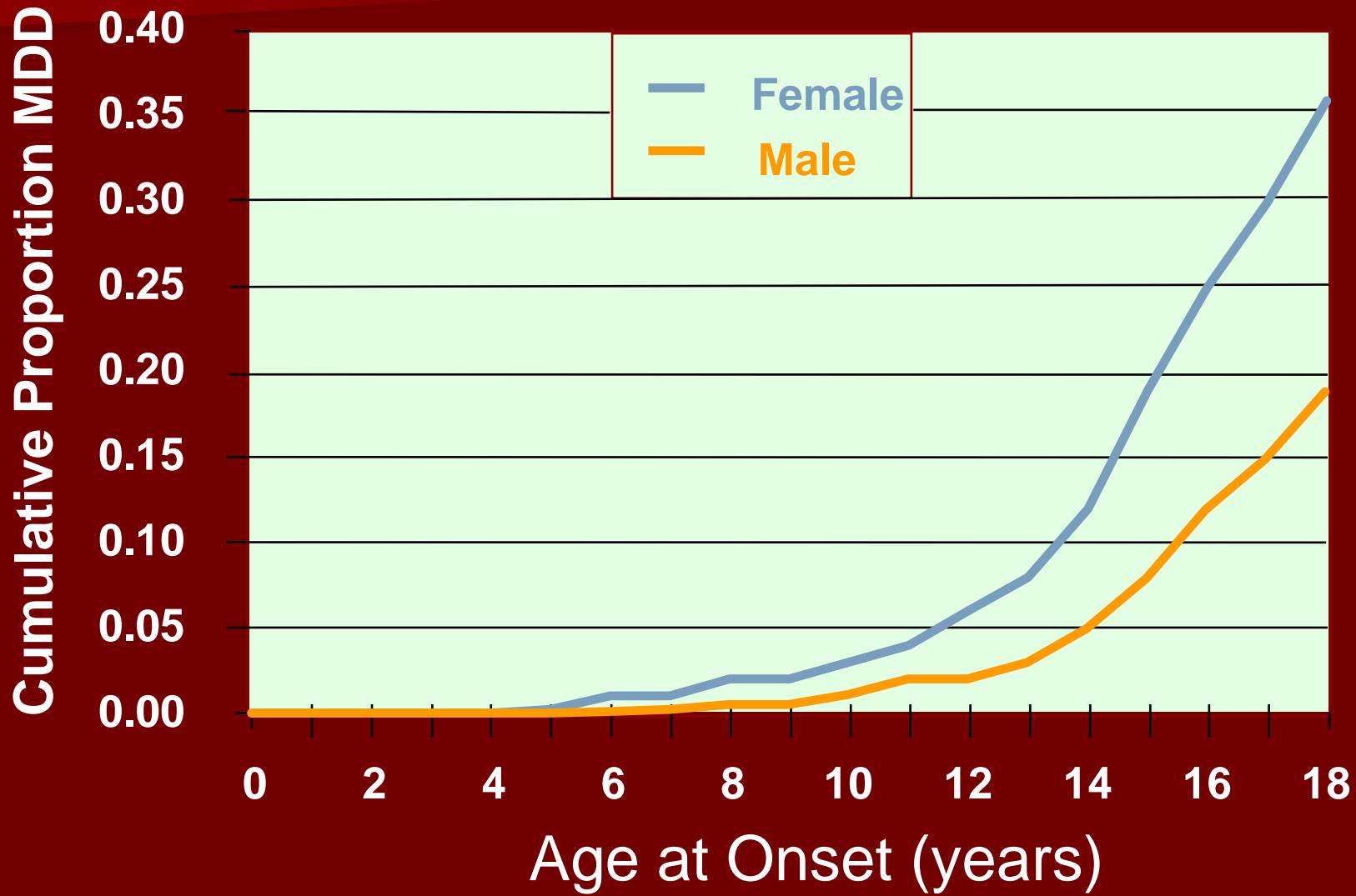
# Goals of Presentation

- Depression prevention meta-analysis
- Our most recent depression prevention randomized controlled trial (RCT)
- Depression-exercise associations
- Depression-substance use disorder (SUD)
- Future directions

# Magnitude of the Problem

- Major depressive disorder (MDD):
  - is very common
  - shows a recurrent course
  - produces functional impairment
  - increases risk for future suicide attempts, marital difficulties, interpersonal problems, unemployment, and legal problems
- A great deal of attention has focused on developing depression prevention programs

# MDD Onset for Males and Females



# Lifetime Comorbidity With Other Disorders

## Major Depression

<b>Other Disorder (%)</b>	<b>No (N=1394)</b>	<b>Yes (N=315)</b>	<b>OR</b>	<b>95 % CI</b>
<b>Dysthymia</b>	<b>2.3</b>	<b>7.0</b>	<b>3.2</b>	<b>1.8 - 5.6</b>
<b>Anxiety</b>	<b>5.5</b>	<b>21.0</b>	<b>4.5</b>	<b>3.2 - 6.5</b>
<b>Substance Use</b>	<b>5.4</b>	<b>21.3</b>	<b>4.8</b>	<b>3.3 - 6.8</b>
<b>Disruptive Behavior</b>	<b>6.0</b>	<b>12.7</b>	<b>2.3</b>	<b>1.5 - 3.4</b>

# A Meta-Analytic Review of Depression Prevention Programs

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# Purpose of Meta-Analysis

- We conducted meta-analytic review to:
  - (1) Summarize effects of prevention programs that have been evaluated in controlled trials
  - (2) Examine participant, intervention, delivery, design, and analysis features that correlate with larger intervention effects

# Studies included in Meta-Analysis

- Identified 37 trials, in which 36 prevention programs were evaluated, resulting in 67 effect sizes
- ~ half were universal programs, half were selective or indicated programs
- Mean age of participants ranged from 10-19
- Most involved both sexes
- 1/3 were school based

# Index of Effect Size (ES)

- Correlation coefficient ( $r$ ) was selected because of similar interpretation across interval, ordinal, and nominal variables
- $r$  also preserves valence of effects
- Used Cohen's (1988) criteria:
  - small ( $r = .10$ )
  - medium ( $r = .30$ )
  - large ( $r = .50$ )( $d = .20, .50, \text{ and } .80, \text{ respectively}$ )

# Results

- 18 programs (50%) produced significant reductions in depressive symptoms or reduced risk for depression onset
- Average effect size:
  - $r = .14$  at posttest
  - $r = .10$  at follow-up
  - both significantly greater than zero but small
- Significant heterogeneity in ES, so it was appropriate to examine moderators

# Sample Interventions with Significant Effects

## ■ CBT group

- Coping with Stress: 15 sessions (45-60 min)
- Penn Resiliency Program: 12 sessions (90-120 min)
- Stice et al.: 4-6 sessions (60 min)

## ■ IPT-Adolescent Skills Training (IPT-AST)

- 8 group sessions (90 min)

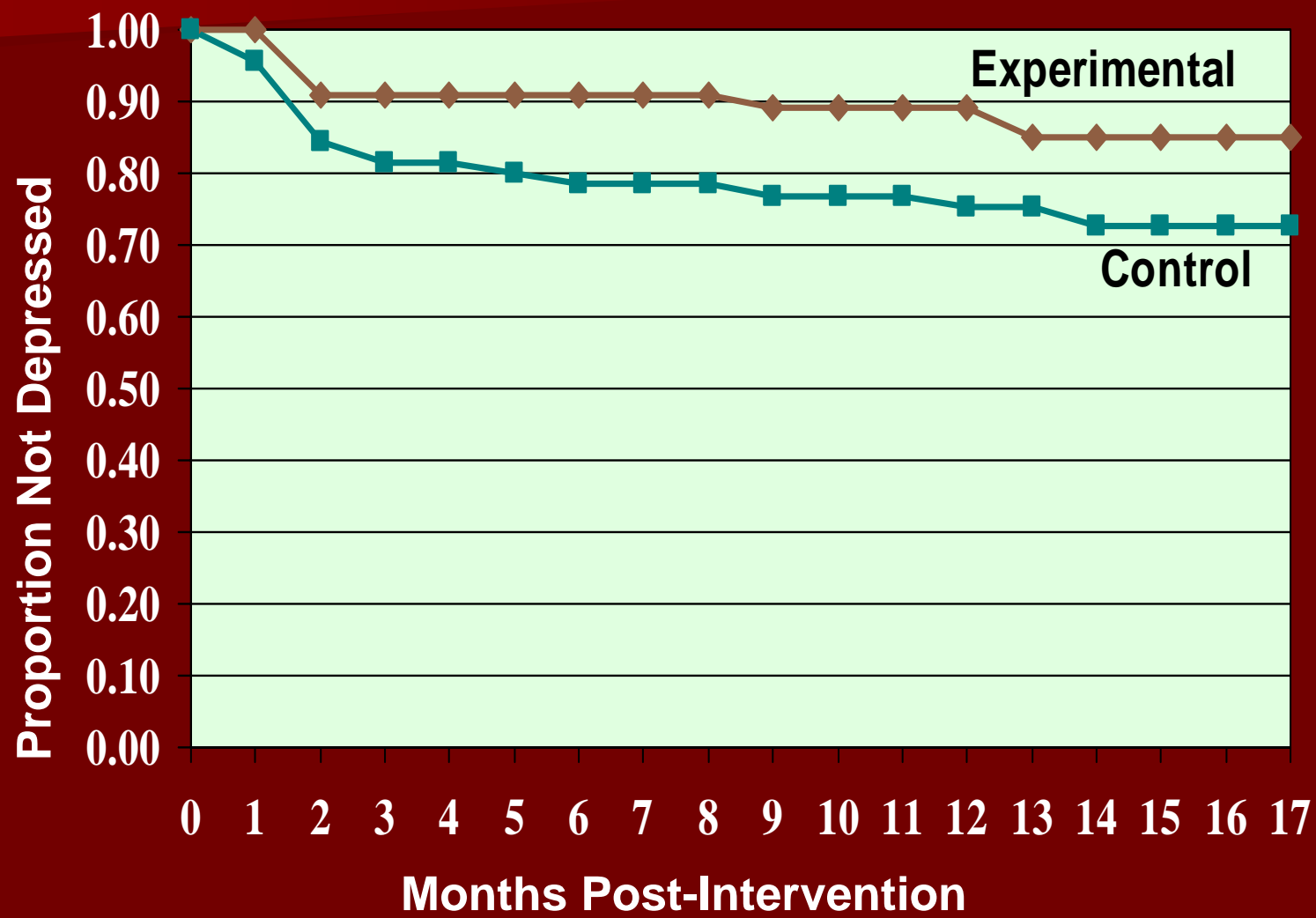
## ■ Bibliotherapy (“Feeling Good”)

## ■ Supportive-expressive group

# Programs that Reduced MDD Onset

- 4 prevention trials have significantly reduced risk for onset of depression:
- 3 with Cognitive-Behavioral
  - Clarke et al. (1995): 14% vs 26% MDD
  - Clarke et al. (2001): 9 vs 29% MDD
  - Stice et al. (in press): 7% vs 13% MDD
- 1 with Interpersonal Psychotherapy
  - Young et al. (2006): 4% vs 29% depressive dx

# MDD Onset Rates in Clarke's Coping with Stress Program



# Moderator Effects

- Larger effects for programs targeting:
  - high-risk youth ( $r = .19$  vs  $.04$ )
  - females ( $r = .20$  vs  $.07$ )
  - programs not focusing on problem solving skills ( $r = .18$  vs  $.07$ )
  - programs delivered by professional interventionists ( $r = .12$  vs  $.03$ )

# Horowitz & Garber (2006) Also Conducted Meta-Analysis

- Used Hedges  $d$  as index
- $d$  ranged from -0.62 to 1.51
- Weighted overall mean effect size was 0.16, which is considered small
- Selective/indicated prevention (mean ES = .30) was greater than weighted mean for universal prevention (mean ES = .12)

# Prevention Success Rate Compared to Other Problem Behaviors

- 49% success rate for depression prevention programs compares well to success rates for other outcomes:
  - HIV (22%)
  - eating disorders (25%)
  - obesity (21%)
  - smoking (60%)

# Magnitude of ES Compared to Other Prevention Work

- Average effect size at posttest ( $r = .14$ ) compares well to ES observed for other outcomes:
  - substance abuse ( $r = .05$ )
  - HIV ( $r = .05$ )
  - smoking ( $r = .07$ )
  - eating disorders ( $r = .12$ )
  - obesity ( $r = .04$ )

# Our Most Recent Prevention Study

Brief Cognitive-Behavioral Depression Prevention Program for High-Risk Adolescents Outperforms Two Alternative Interventions: A Randomized Efficacy Trial

Eric Stice

University of Texas at Austin

Paul Rohde

John R. Seeley

Jeff M. Gau

Oregon Research Institute

(in press, *JCCP*)

# Evaluated 4 Conditions

## ■ CB group

- 6 weekly 1-hour sessions
- focus on reducing negative cognitions and increasing pleasant activities

## ■ Supportive-expressive group

- focus on establishing rapport, expressing emotions, providing support
- No active advice or CBT material

## ■ Bibliotherapy

## ■ Assessment only control

# Examined Relevant Factors

- Successful randomization
- Comparability across treatments:
  - Treatment expectancies (do Ss have same expectations?)
  - Attendance (did Ss get same and adequate “dose?”)
  - Satisfaction with program (do Ss feel prepared?)
  - Facilitator’s fidelity and competence
  - Attrition rates (do Ss drop out of assessments?)
- Did cross-condition contamination occur? Few remembered other conditions and none talked with participants receiving other conditions

# Available Data

- Randomized 341 participants:
  - CB group = 89
  - Supportive group = 88
  - Bibliotherapy = 80
  - Assessment controls = 84
- Post-test data on 97%
- 6-month follow-up completed (94%)
- Will eventually collect 2-year follow-up

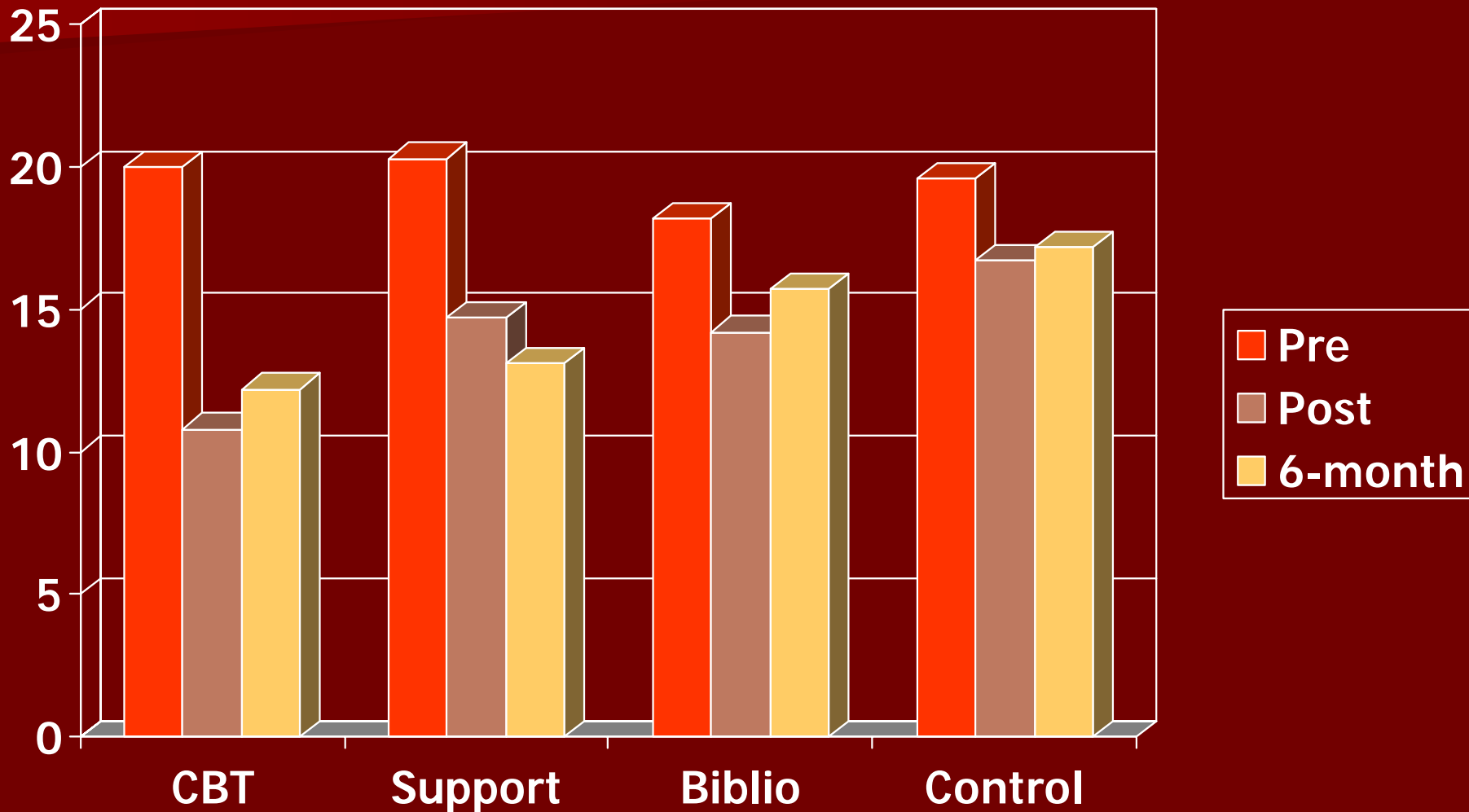
# BDI Changes Pre to Post

	CB	Supportive	Biblio
Supportive	$p = .008^{**}$ $d = .29$		
Biblio	$p < .001^{***}$ $d = .41$	$p = .240$ $d = .13$	
Control	$p < .001^{***}$ $d = .50$	$p = .051$ $d = .21$	$p = .46$ $d = .08$

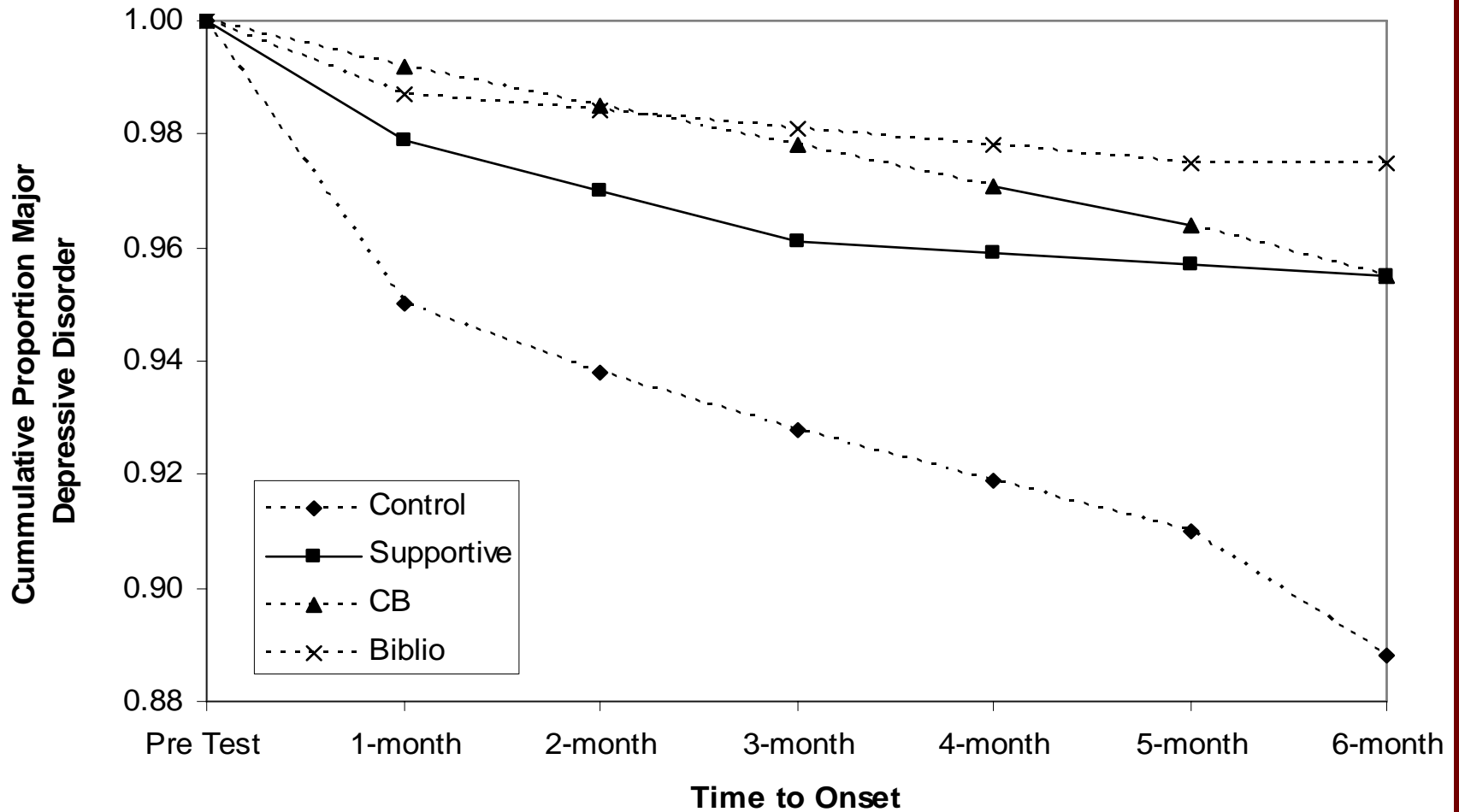
# BDI Changes Pre to 6-Month FU

	CB	Supportive	Biblio
Supportive	p = .654 d = .05		
Biblio	p < .001*** d = .38	p = .002** d = .33	
Control	p < .001*** d = .39	p = .002** d = .34	p = .95 d = .01

# BDI Scores for 4 Conditions



# Onset of MDD by Condition



# CB Group Had Better Adjustment and Reduced Substance Use

- CB participants showed significantly improved social adjustment and reduced substance use at post and 6-month follow-up compared to Ss in all three other conditions:
- CB vs Control on Substance Use
  - $d = .28$  at post and  $.46$  at 6-month follow-up
- CB vs Control on Social Adjustment
  - $d = .35$  at 6-month follow-up

# Exercise to Reduce or Prevent Depression/Anxiety in Youth

- Nordheim, Hagen, & Heian (2006) searched databases for randomized trials of vigorous exercise interventions for children and teens up to age 20 with outcome measures for depression and anxiety
- Identified 16 studies (total N = 1,191) with participants between 11 - 19 years of age
- REFERENCE: Larun L, Nordheim LV, Ekeland E, Hagen KB, Heian F.. Exercise in prevention and treatment of anxiety and depression among children and young people. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD004691. DOI: 10.1002/14651858.CD004691.pub2

# Vigorous Exercise vs. None

- 11 trials compared vigorous exercise versus no intervention in general population
- 6 reporting anxiety scores showed nonsignificant trend in favor of exercise group; standard mean difference (SMD from random effects model) = -0.48, 95% CI = -0.97 to 0.01
- 5 reporting depression scores showed statistically significant difference in favor of exercise group; SMD = -0.66, 95% CI = -1.25 to -0.08

# Nordheim et al. (2006) (contd.)

- Trials were generally of low methodological quality and were highly heterogeneous with regard to population, intervention and measurement instruments used
- 1 small trial examined depressed children in treatment; no significant difference in depression for vigorous vs no exercise
- No trials examined children in anxiety treatment

# High vs. Low Intensity Exercise

- 5 trials compared vigorous exercise to low intensity exercise in general population
- No statistically significant difference in depression and anxiety scores
- 2 small trials looked at depression for children in treatment; no differences
- No trials examined children in treatment for anxiety

# Exercise vs. Psychosocial Tx

- 4 trials compared exercise with psychosocial interventions in general population of children
- No statistically significant difference in depression and anxiety scores
- 1 small trial with children in treatment found no difference for depression scores
- No trials examined children in treatment for anxiety

# Nordheim et al. Conclusions

- Appears to be small effect in favor of exercise in reducing depression and anxiety scores in general population of children and adolescents
- However, small number of studies and lack of diversity in samples, interventions, and measurements limits ability to draw conclusions
- High or low intensity made no/little difference
- Effect of exercise for children in treatment for anxiety and depression is unknown

# Recent RCT with Depressed Adults

- Dunn, Trivedi, Kampert, Clark, & Chambliss (2005) tested whether (a) exercise is efficacious treatment for mild/moderate MDD, and (b) the impact of dose and frequency
- Exercise was performed in supervised laboratory with 80 adults (20-45 years of age)
- Ss randomized to 4 exercise groups that varied total energy expenditure (low vs recommended dose) and frequency (3 vs 5 days/week) or to placebo control (3 days/week flexibility class)

# Dunn et al. (2005) Results

- Significant main effect of intensity in reducing depression severity (HRSD) at 12 weeks
- HRSD scores at 12 weeks were reduced 47% from baseline for high dose, compared with 30% for low dose and 29% for control
- No effect of exercise frequency
- Conclusion: Aerobic exercise at dose consistent with public health recommendations is effective treatment for mild/moderate MDD. Lower dose is comparable to placebo effect.

# Exercise Mechanisms on Depression

- Exercise may have psychological and physical effects on depression and anxiety:
  - Increased confidence
  - Distraction from cognitive rumination
  - Increased social interactions
  - Improved coping
  - Cognitive dissonance (“I’m a healthy person who takes care of her/himself”)

# Exercise Mechanisms (contd.)

- Other effects on depression/anxiety:
  - Increased self-efficacy and enhanced esteem
  - Sense of control
  - Sense of achievement/success
  - Behavioral activation
  - Increased availability of neurotransmitters
  - Role of beta - endorphins in mood regulation
  - Improved sleep

# Role of Self-Efficacy

- Two types of relevant Self-efficacy
  - Task efficacy = perceived competence to complete physical task
  - Scheduling efficacy = perceived competence in fitting exercise into busy life schedule
- Ryan (2008) found that direct path between Physical Activity → Depressive symptoms became ns when efficacy (task and scheduling) and esteem (Physical leading to Global) were controlled for

# Models of Depression/SUD

- Self-Medication
  - drug abuse is a maladaptive coping mechanism to mitigate depression
- Affective Consequences
  - drug abuse creates or exacerbates depression
- Independent Factors
  - independent factors promote and maintain substance use disorder and depression
- Reciprocal Relations
  - each contributes to maintenance of other

# Support for Self-Medication

- MDD predict SUD in community adolescents
- Depression treatments (CBT or medications) improve SUD outcomes for depressed adults in addiction treatment
- However,
- Others find depression in community adolescents does not predict substance use.
- Treating depression did not reduce SUD in adolescents (e.g., Riggs et al., 2001; Rohde et al., 2004; Schmitz et al., 2001)

# Support for Affective Consequences

- Among patients, SUD precedes depression in majority of comorbid adults
- Depression often remits in addicted adults after detoxification
- However,
- Likelihood of spontaneous depression remission following detoxification is less pronounced in adolescents
- Depression increases SUD relapse risk, which is inconsistent with Affective Consequences model

# Support for Independent Factors

- Significant depression reductions occurred with no corresponding change in SUD (Rohde et al., 2004)
- However,
- Comorbidity reduces effectiveness of both treatments
- Some support for impact of depression treatment on SUD
- Higher relapse following SUD treatment for depressed patients
- Suggest that recovery in one condition is related in some way to recovery in other

# Support for Reciprocal Relations

- Given magnitude of research supporting the Self-Medication and Affective Consequences models, empirical findings converge to provide most support for a reciprocal relations perspective
- Although evidence tends to favor the Affective Consequences model more than Self-Medication

# Holes in Research Base

- There are many.....
- Some pressing issues include:
  - Temporal order of depression and exercise associations (which comes first? in which subgroups?)
  - Ability to successfully increase exercise rates in depressed adolescents
  - Role of gender

# Impact of Gender

- Depression: Analyzing data from National Longitudinal Study of Adolescent Health (n ~19,000, ages 11-21). Obesity associated with depressive symptoms (CES-D) for girls but not boys (Needham & Crosnoe, 2005)
- Delinquency: Vigorous activity associated with higher risk of delinquency for male adolescents but lower risk for females (Allison et al., 2005)

# Gender Differences (contd.)

- Smoking: ~ 60% of articles reported definite negative association between smoking and physical activity but relationship was often attenuated or reversed among adolescents and males (Kaczynski et al., 2008)

# What Seems Most Likely to Succeed

- Longitudinal research on Depression-Exercise associations (even across one year)
- More methodologically rigorous research in prevention and treatment
- Use of exercise as additional arm in trial
- Augmentation of standard depression programs with exercise
- Conduct interventions in group format
- Emphasize small, realistic but long-term goals and problem-solve barriers and obstacles
- Identify subgroups most motivated to exercise

# Thank You!

- If questions, please email me at  
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