Gateways to Appearance and Performance Enhancing Drug Use

Doping in Recreational Sports
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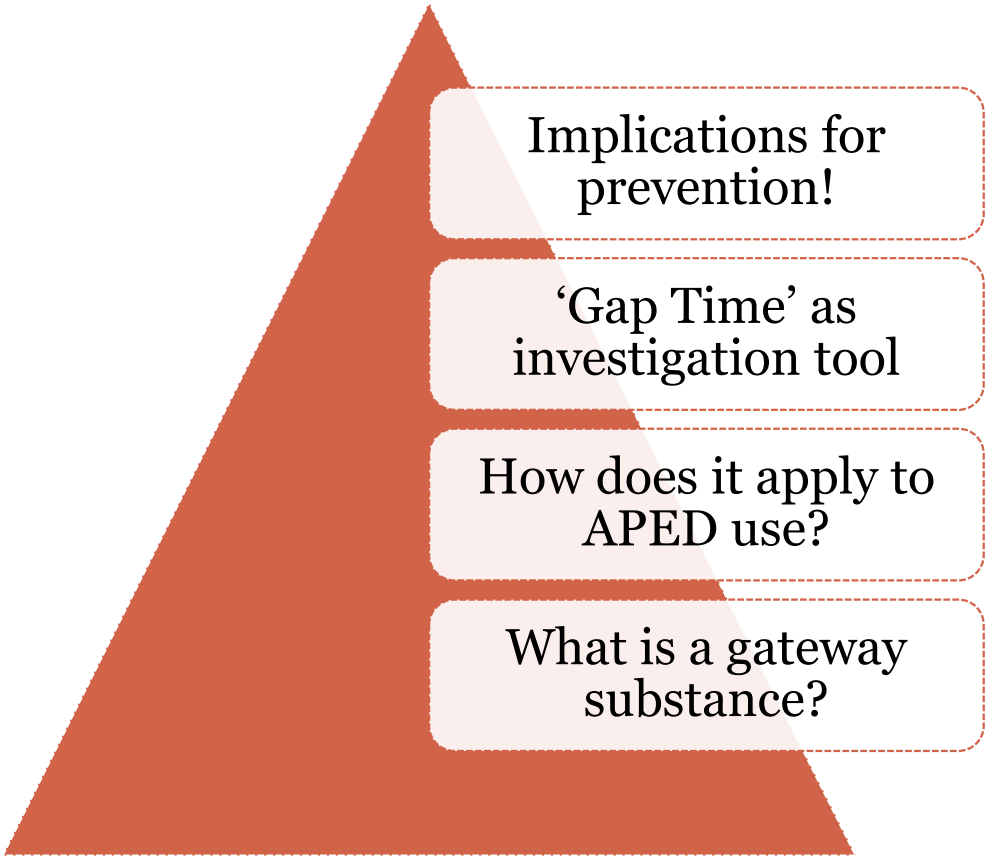
Introduction and Orientation



What is a ‘Gateway Substance”

DEVELOPMENTAL SEQUENCING OF DRUG USE

‘Gateway Hypothesis’

- Milder drugs cause initiation of more severe drug use

a). *A fixed, temporal sequence whereby use of one drug precedes the use of another drug*

b). *A strong association between the two constructs, whereby people who use the initial drug are at an increased risk for using the subsequent drug*

c). *A causal link, which establishes that use of the initial drug brings about the use of the subsequent drug.*

Kandel, (1975) *Science*,190; 912–914; Fergesson, Boden, Horwood, 2007, *Addiction,* 101;556-9.

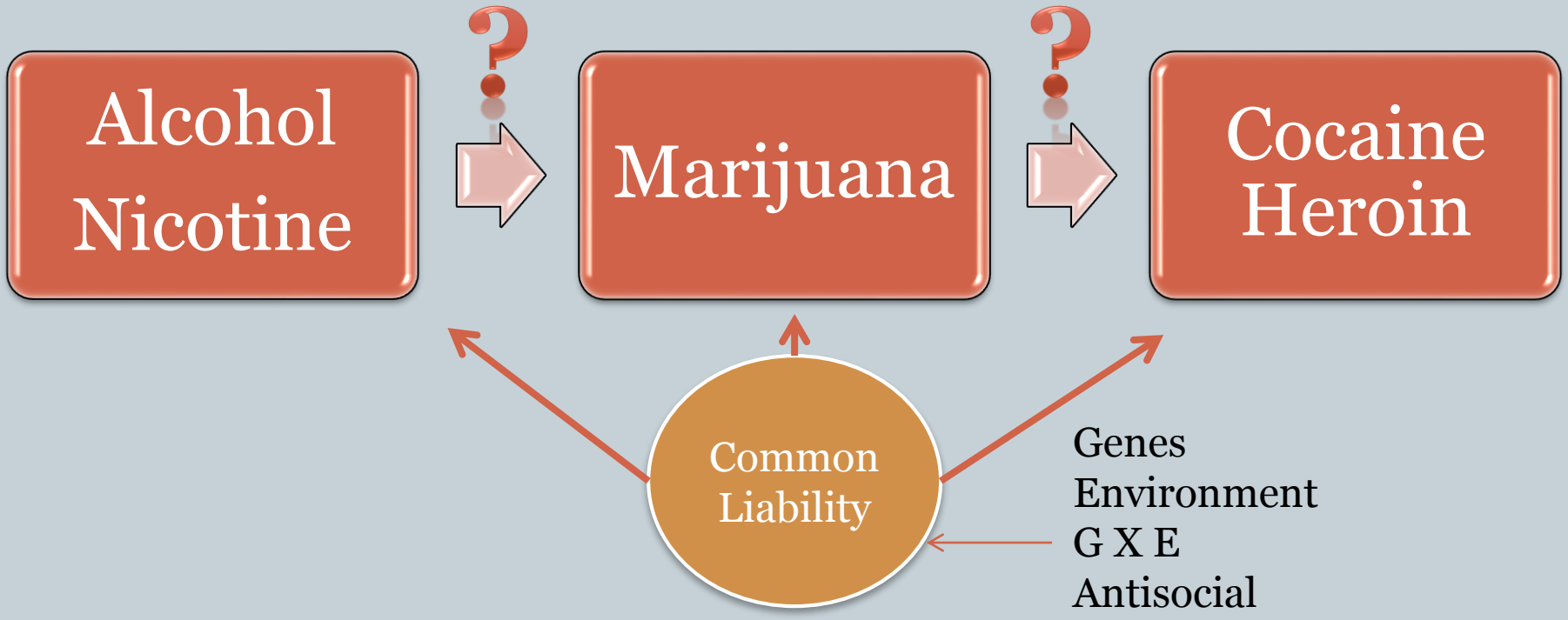
Sequential Progression

Strong Association

- Hypothesis: Smokers/Drinkers tend to also use marijuana
  - Smokers more likely to use marijuana and develop dependence
- Hypothesis: Marijuana users tend also be cocaine or heroin users
  - Adolescents using marijuana more likely to use prescription opioids

Hindocha et al. (2015) *DAD*, 148, 165-71.; Fiellin et al. (2013).*JAH*, 52(2) 158-63.

Causal Links?… Or Common Liability



Criticisms of Gateway Hypothesis

- Unable to support connecting mechanisms
  - Doesn't explain how one moves from one stage to another
- Unable to explain errors in sequencing
  - Many individuals move in reverse order of the sequence
- Unable to explain variability in the severity of the SUD at any stage of development
  - Age of onset (earlier = worse outcome) mediates severity of substance use

Vanyukov et al. (2012). *DAD,* 123S, 3S-17S

Does the ‘Gateway Hypothesis’ Apply to APEDs?

THEORY AND SUPPORT

A Case of Mistaken Identity

APEDs	Illicit Drugs
• Goal Driven • Detail Planning • No Euphoria • Delayed Effect • Prolonged use • Improves some functional markers	• Cue-driven • Opportunistic • Euphoria • Immediate Effects • Acute use • Impairs most functional markers

Rationale for Gateway Hypothesis?

- Wide range of substances that vary in:
  - Availability—Regulations
  - Severity of side effects
  - Abuse potential and potency
- Almost all APED users engage in polypharmacy
  - Near 100% of illicit APED users in our samples
  - Replicated in every modest sized sample where data are collected
- APED use is not an impulsive drug choice
  - No acute euphoria associated with most AASs or similar agents
  - Cultural context is stable despite heterogeneity in substances

Candidate Gateway Substances for APEDs

- Nutritional supplements are *legally* purchased
  - 12-15% of nutritional supplements contain illegal prohormones or AAS (Martello et al. 2007; *Food Addit Contam*, 24;258-65)
- Use of dubious claims, no safety information (Barret, 2003; *Int J Toxicol*, 22;392-2)
  - Failure to deliver on claims yields escalation of use
- Which supplements?
  - General Health
  - Muscle building/Mass building
  - Endurance/Fat burning

Adapting the Gateway Hypothesis

<u>Use of fitness supplements 'causes' use of illegal and/or risky APED use</u>

- *A) Fitness supplement use precedes use of synthetic androgens (anabolic steroids).*
- *B) There is a strong association between Fitness supplement use and synthetic androgens.*
- *C) There is a causal link that establishes how Fitness supplements bring about use of synthetic androgens*
  - *This 'causal' relationship is hypothesized to be psychosocial, not biological per se.*

Pilot Test of Gateway Hypothesis

Psychology of Addictive Behaviors
2012, Vol. 26, No. 4, 955–962

0893-164X/12/$12.00 DOI: 10.1037/a0027877

BRIEF REPORT

Fitness Supplements as a Gateway Substance for Anabolic-Androgenic Steroid Use

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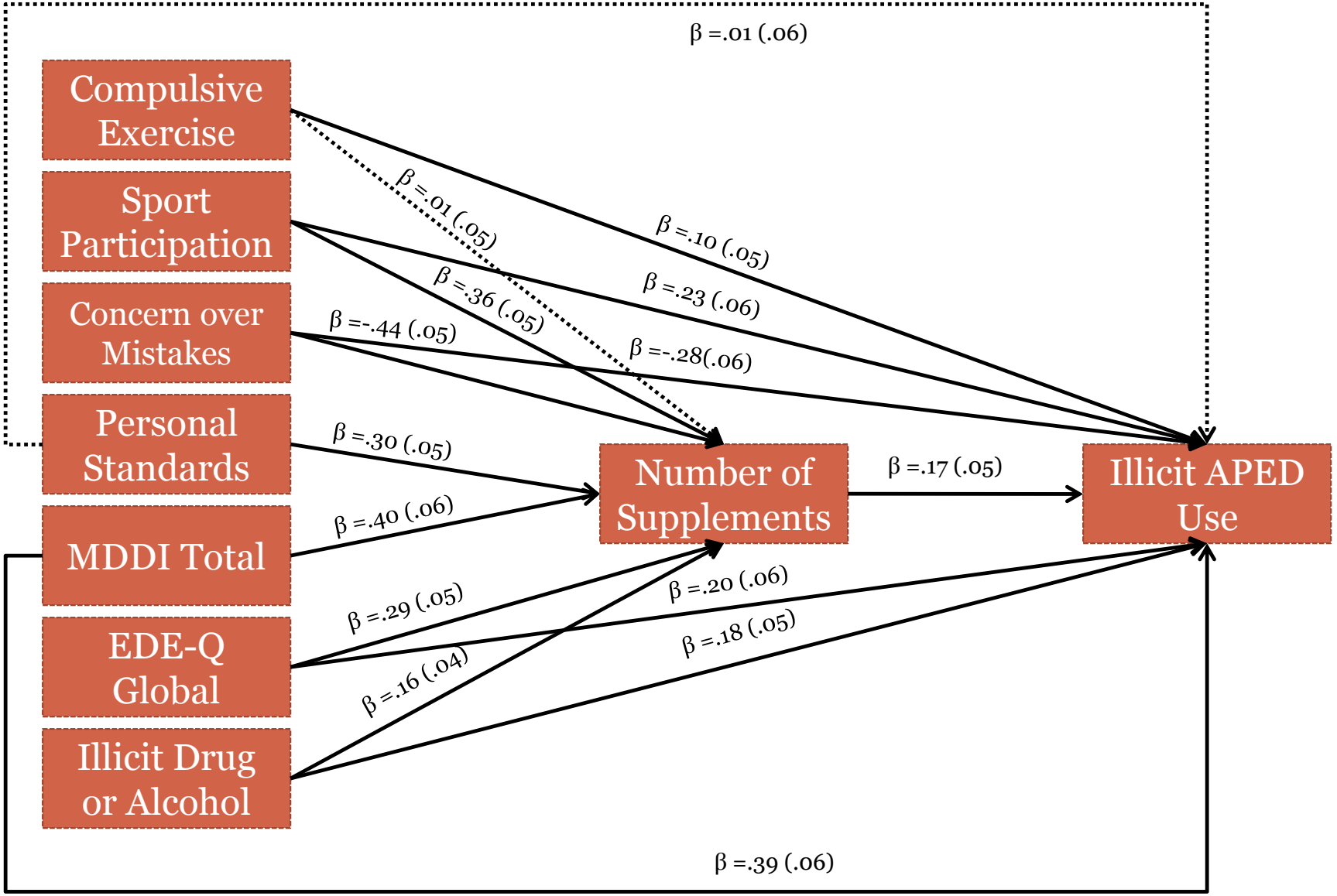
Approximately 3.0% of young Americans have used anabolic-androgenic steroids (AAS). A traditional model of adolescent substance use, the gateway hypothesis, suggests that drug use follows a chronological, causal sequence, whereby initial use of a specific drug leads to an increased likelihood of future drug use. Therefore, the use of illicit appearance and performance enhancing drugs (APED), such as AASs, also follows an analogous progression, whereby legal APEDs, (e.g., nutritional supplements) precedes illicit APED use. We examined the relationship between nutritional supplement use, beliefs about APEDs, and APED use in 201 male (n = 100) and female (n = 101) undergraduates. Participants completed measures of muscle dysmorphia (MDDI), body checking (BCQ, MBCQ), eating disorder symptoms (EDE–Q), perfectionism (FMPS), positive beliefs about the efficacy–safety of AAS use and APED use patterns. A series of covariance structure models (CSM) showed body image disturbance, compulsive exercise, illicit drug use, and perfectionism, independent of gender, were significant predictors of positive beliefs about AAS. Those who used both fat burning and muscle building supplements reported the strongest beliefs in AAS efficacy–safety, which was associated with higher likelihood of current illicit APED use. There was evidence of significant indirect relationships between supplement use and illicit APED use through contact with other AAS users and beliefs about AAS. The potential role for nutritional supplement use in the initiation of illegal APED use is discussed. Future prevention efforts may benefit from targeting legal APED users in youth.

Keywords: anabolic-androgenic steroids, gateway hypothesis, nutritional supplements, body image disturbance, risk factor

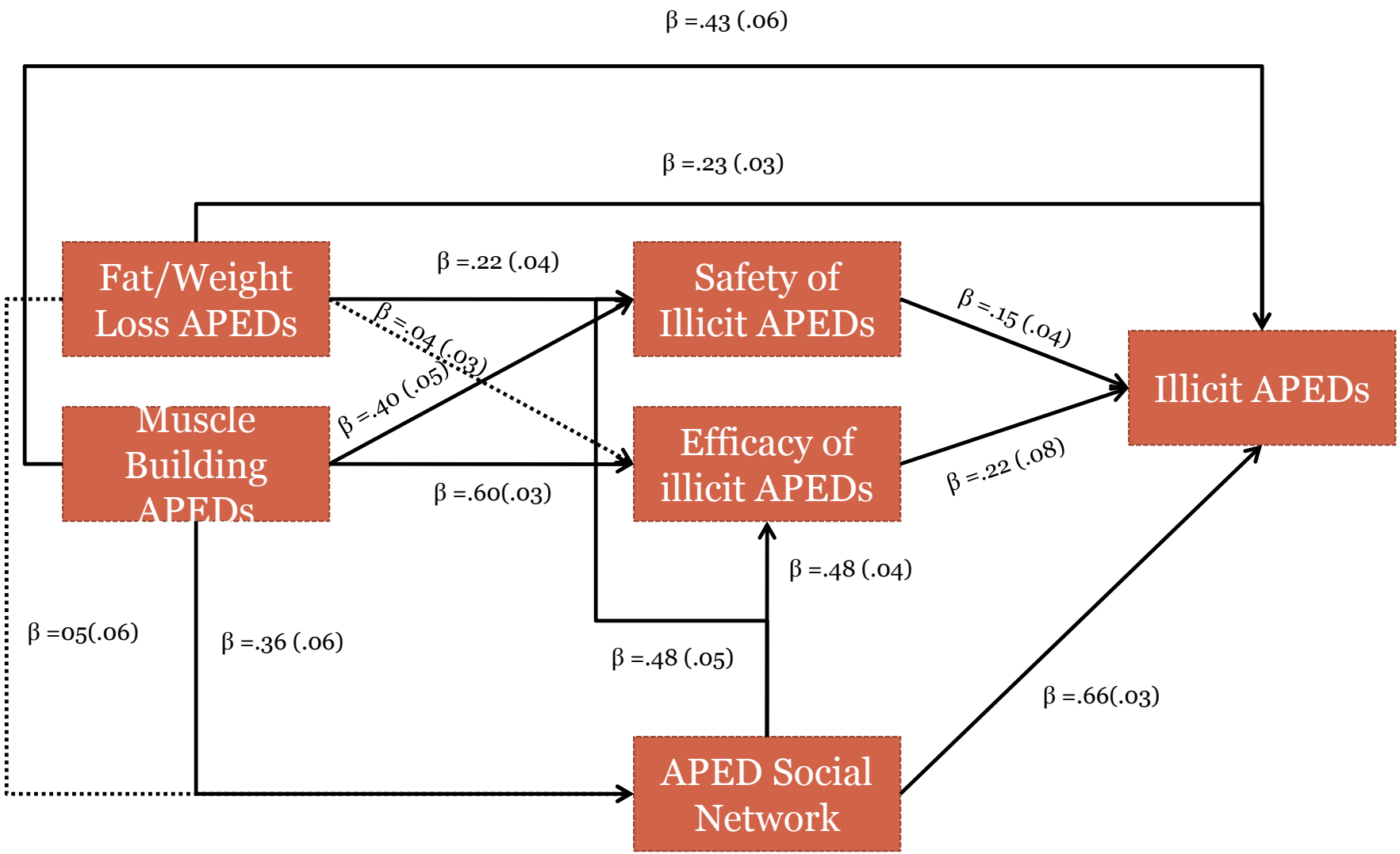
Hypothesized Relationships

- Strong relationship between supplement use and self reported illicit APED use (i.e., AASs).
- Supplement use statistical mediator of relationship between psychosocial risk factors and illicit APED use.
  - Sports Participation
  - Perfectionism
  - Eating disorder symptoms
  - Body image disturbance
  - Illicit drug use (i.e., cocaine, marijuana, opiates)
- This 'causal' relationship occurs through the role supplements play in…
  - Changing beliefs about efficacy and danger of AASs
  - Providing access and information exchange with 'sources' who can teach about AASs



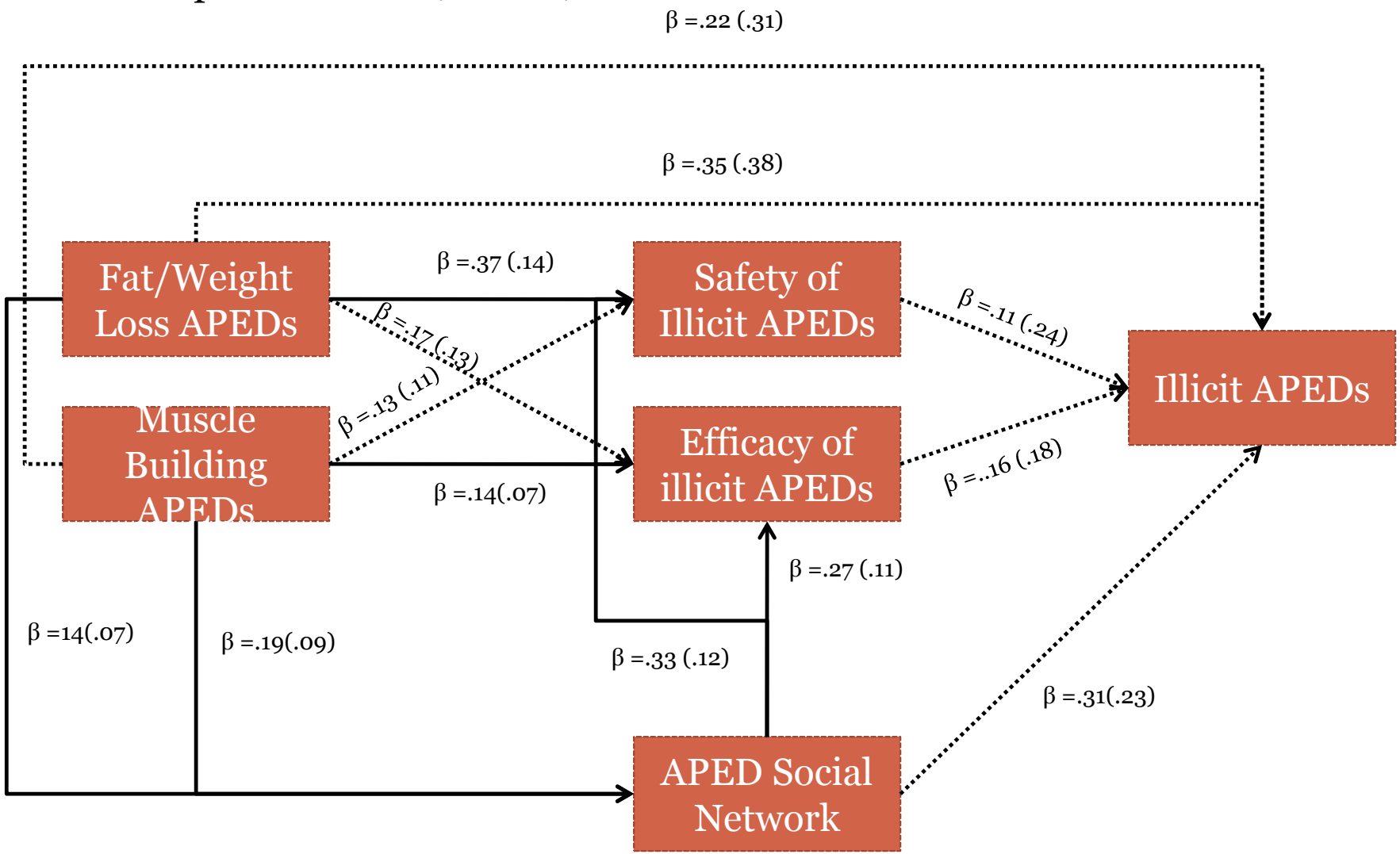
$X^2(2) = 3.36$, $p = .19$, RMSEA = .01, CFI = .98

Male Specific Model (n = 100)



$X^2(2) = 59.99$ $p < .001$, RMSEA = .04, CFI = .98

Female Specific Model (n = 101)



$X^2(7) = 122.31$ $p < .001$, RMSEA = .03, CFI = .98

Indirect Effects

Table 2
Summary of Indirect Effects With Bootstrap Bias Corrected Standard Errors for Supplements on Illicit APED Use

Predictor	Via	Partial indirect effect	Total indirect effect
Muscle building supplements	APED efficacy	.129 (.114–.133)	
	APED network	.042 (.038–.048)	
			.170 (.161–.177)
Muscle building supplements	APED safety	.061 (.049–.075)	
	APED network	.029 (.018–.034)	
			.090 (.083–.091)
Muscle building supplements	APED network	.267 (.263–.275)	
Fat–Weight Loss supplements	APED safety	.034 (.019–.045)	
	APED network	.004 (−.001–.012)	
			.038 (.018–.050)

Note. APED = appearance and performance enhancing drug use. 95% confidence intervals in parentheses.

Summary

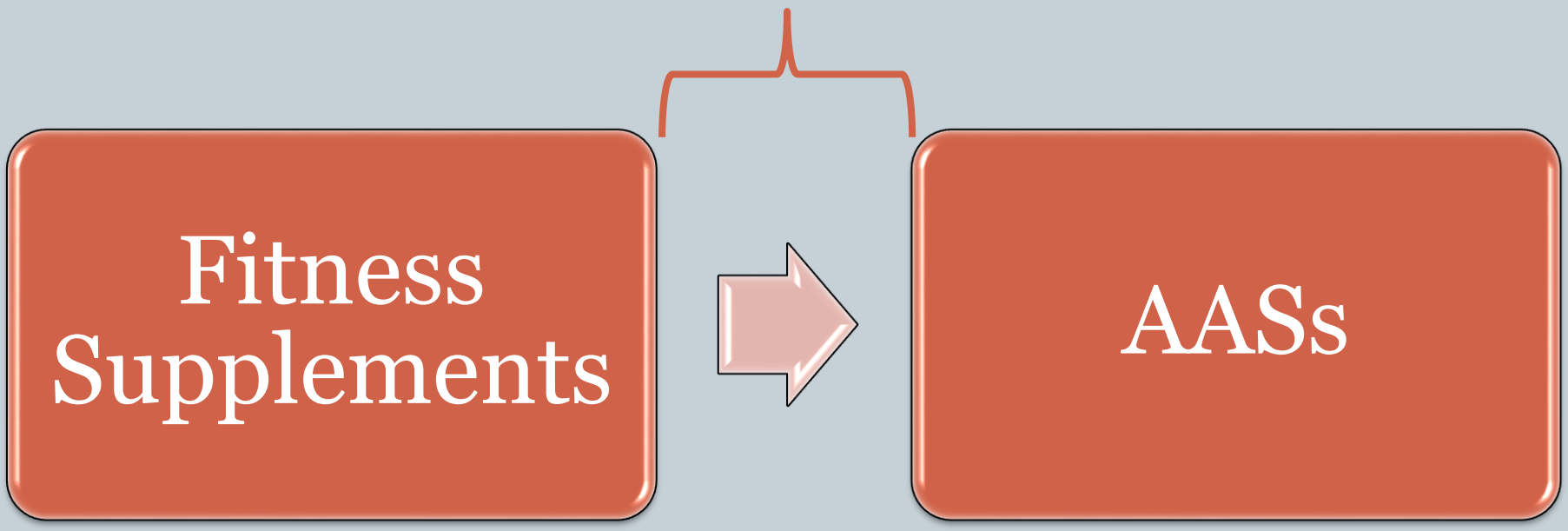
- Gateway Hypothesis is a plausible for APEDs
  - Does not rule out effects of common liability but…
    - APED use is quite distinct from other substances of abuse
- Gateway Hypothesis for APEDs suggests
  - Fitness supplements are potential gateway substances
  - Causal mechanisms are complex and related to psychosocial environment
- Social context matters…
  - Access offered from fitness supplement use may affect internal beliefs about safety and efficacy of AASs.

How to use ‘Gap Time’ to investigate Gateway Hypotheses

ACCELERATING RISKS FOR DRUG INITIATION

Sequencing and Gap Time?

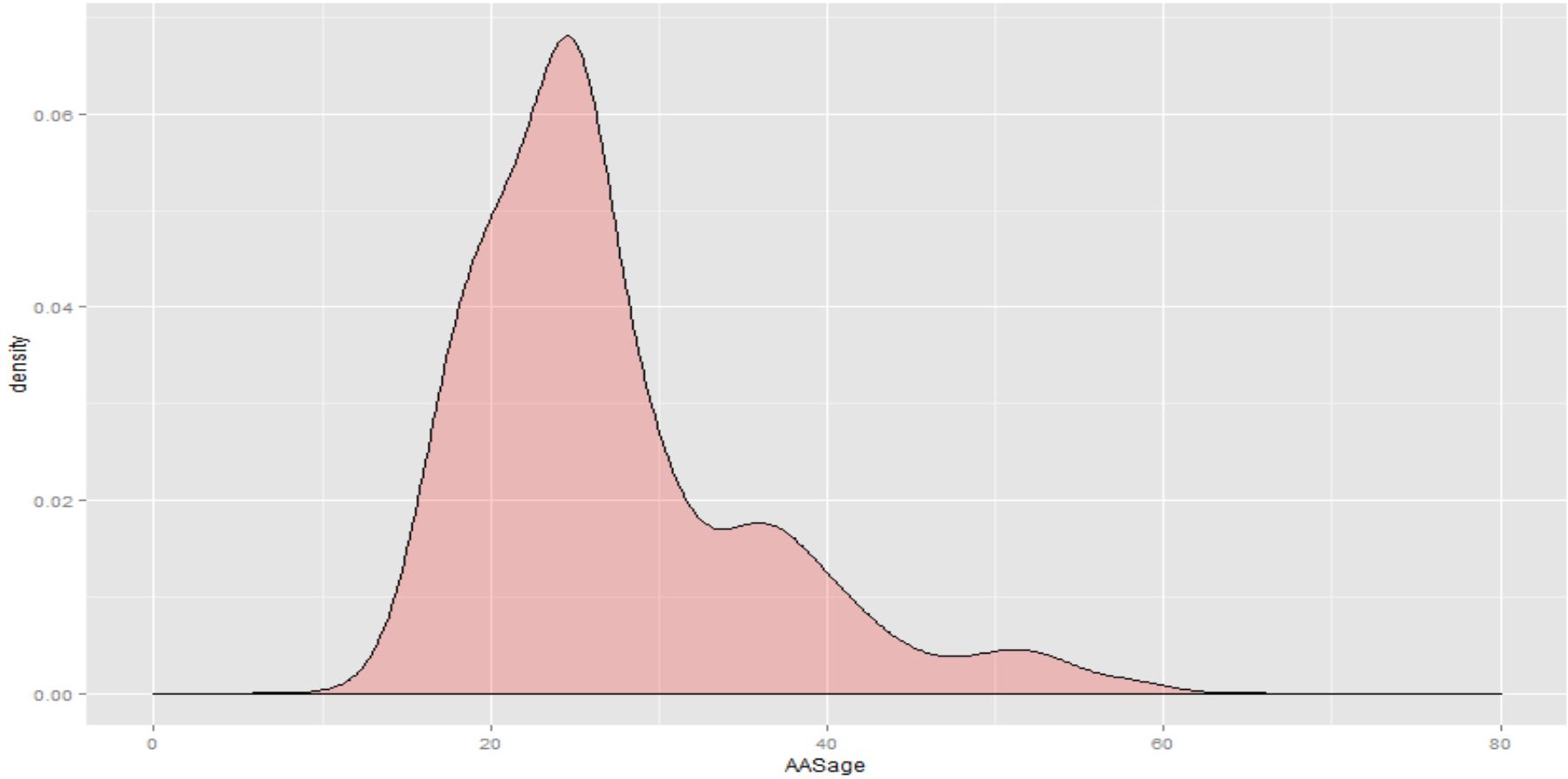
Time between first use of distinct substances



When do users initiate AASs?

- ~3% young adult males (majority in USA)
- Median age of onset = 25

N = 1000 Male AAS users



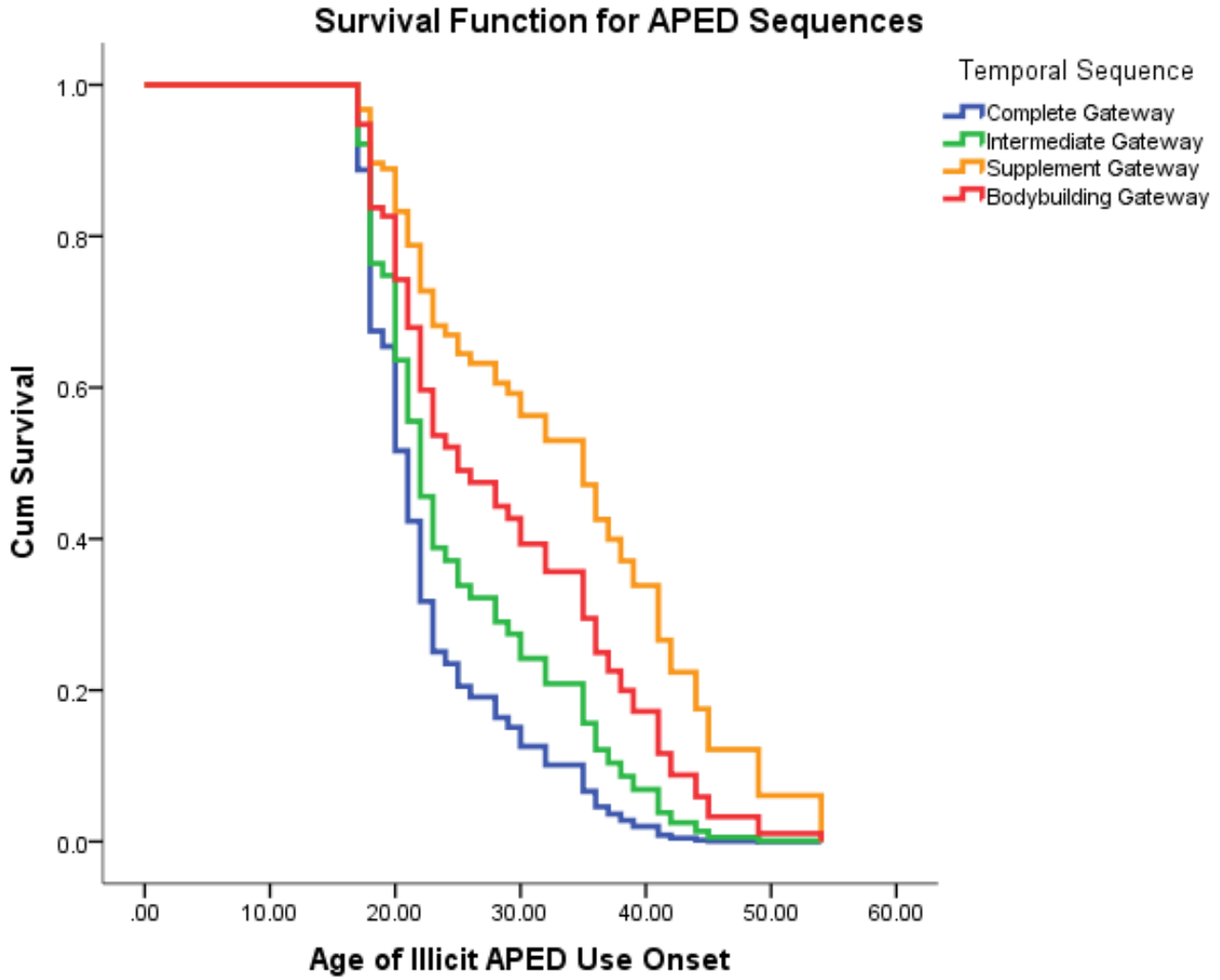
Hildebrandt et al. *unpublished data*

Is There Evidence Sequencing?

Temporal Sequence	Nutritional Supplement	Prohormone	OTC Fat Burner	Illicit APED	Total %
Complete Gateway	1	2/3	2/3	4	29.69%
Intermediate Gateway	1	2	2	3	42.19%
Supplement Gateway	1	-	-	2	15.63%
Bodybuilding Gateway		1	1	2	12.5%
Age	19.79 (6.92)	22.14 (7.48)	21.52 (6.52)	26.8 (9.6)	

N = 84 APED users

Sequence is Associated with Age of Onset



Modeling Gap Time

- 143 adult AAS users + 29 heavy exercising controls(N = 172)
  - Age 18 to 60 (M = 34.16, SD = 10.43)
  - 73.3% primarily heterosexual (n = 126),
- Age of onset take from Structured Interview (APEDUS)
  - MDDI
  - EDE-Q
  - Barratt Impulsivity Scale (BIS-11)
  - Influences (Self-directed vs. Other-directed)

Table of Gap Time Correlations

Social Influence X Eating Disorder Symptoms

Source of social influence matters ***Less*** among those with ***Greatest*** eating concerns

Klimek & Hildebrandt, *manuscript in preparation*

Social Influence X Impulsivity

Source of social influence matters ***Less*** among those with ***Greatest*** impulsivity

Age of Supplement Onset X Impulsivity

Impulsivity matters ***More*** for those using supplements at a ***Older*** age

Implications for Prevention

IDENTIFYING WHO TRANSITIONS QUICKLY

Who Do We Target?

- Quick Transitions
  - Middle aged men with high degree of impulsivity
  - Eating Concerns and Impulsivity for those self-motivated
- Eating Concerns
  - Focused concerns about the effects of eating and implications for deviating from rule bound eating
- Impulsivity
  - Disposition to act without planning, seek reward, and difficulty inhibiting an unwanted action.

Self-Motivated Individuals

- Target interpersonal domains
  - Reduce concerns about eating and its effects
    - Psychoeducation
    - Behavioral interventions to normalize habits
    - Cognitive interventions reducing value of eating rules
  - Reduce impact of impulsive action
    - Mindfulness-based interventions
    - Stimulus-control (limit access to triggers)
  - Age adjusted targets
    - Middle age med have rapid transitions and are most vulnerable

Other-Influenced Individuals

- Target social environment
  - Social skills training
    - Assertiveness
  - Improve self-esteem
    - Rely on others less for guidance
- Target natural environment
  - Limiting access or discussion in gym settings to supplements
  - Regulating information on safety and efficacy of substances

Closing Thoughts

- Developmental sequence of APEDs remains poorly understood.
- Need more longitudinal data!
- Scaling APED use severity remains a hurdle limiting theory about gateways
  - Use may be less meaningful than what type of use for most APEDs