Predictive Validity of the YLS/CMI In Nebraska

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The **Risk-Need-Responsivity Model (RNR)** (Andrews and Bonita, 2010)

- Assess risk through criminogenic needs
- Intervene through techniques that are Evidence Based *and* that are tailored to the characteristics of the offender

RNR

Assessing Risk

Evidence Based Practice

Tailoring to Individual Needs

YLS/CMI

(Hoge and Andrews, 2002)

- Adaptation of the LSI-R
- Measures risk and needs of adolescent offenders
- Developed specifically for probation officers and mental health professionals to administer

Youth Level of Service/Case Management Inventory (YLS/CMI)

Measure Description: 42 items measure 8 domains: (each item is coded as present or absent)

1. **Prior and current offenses/dispositions**
2. **Family circumstances/parenting**
3. **Education/employment**
4. **Peer relations**
5. **Substance abuse**
6. **Leisure/recreation**
7. **Personality/behavior**
8. **Attitudes/orientation**

Hoge & Andrews (2002)

Problem

Does the YLS/CMI possess sufficient predictive validity as it is used in the Nebraska Juvenile Justice System?

Basic Concepts

It's all about error….

Basic Concepts

- **Random Error**
- **Systematic Error**
- **Reliability**
- **Validity**

Random Error

Unpredictable errors that go in different directions

- **Fluctuations in measurement that are inconsistent in direction and magnitude**
- **Result from random individual differences in raters emotions, attitudes, cognitive understanding**
  - **Temporal events that change over time in haphazard ways**
  - **Different people respond to the same stimulus materials in different ways that are unpredictable**

Reliability

Absence of random error

- **Measurement that produces the same results repeatedly with the same stimulus materials**
- **Controls individual differences in raters' emotions, attitudes, cognitive understanding as they impact behavior of interest**
- **Events are unchanged over time**
- **Different people respond to the same stimulus materials in the same predictable ways**

Systematic Error

Predictable errors that go in same direction repeatedly

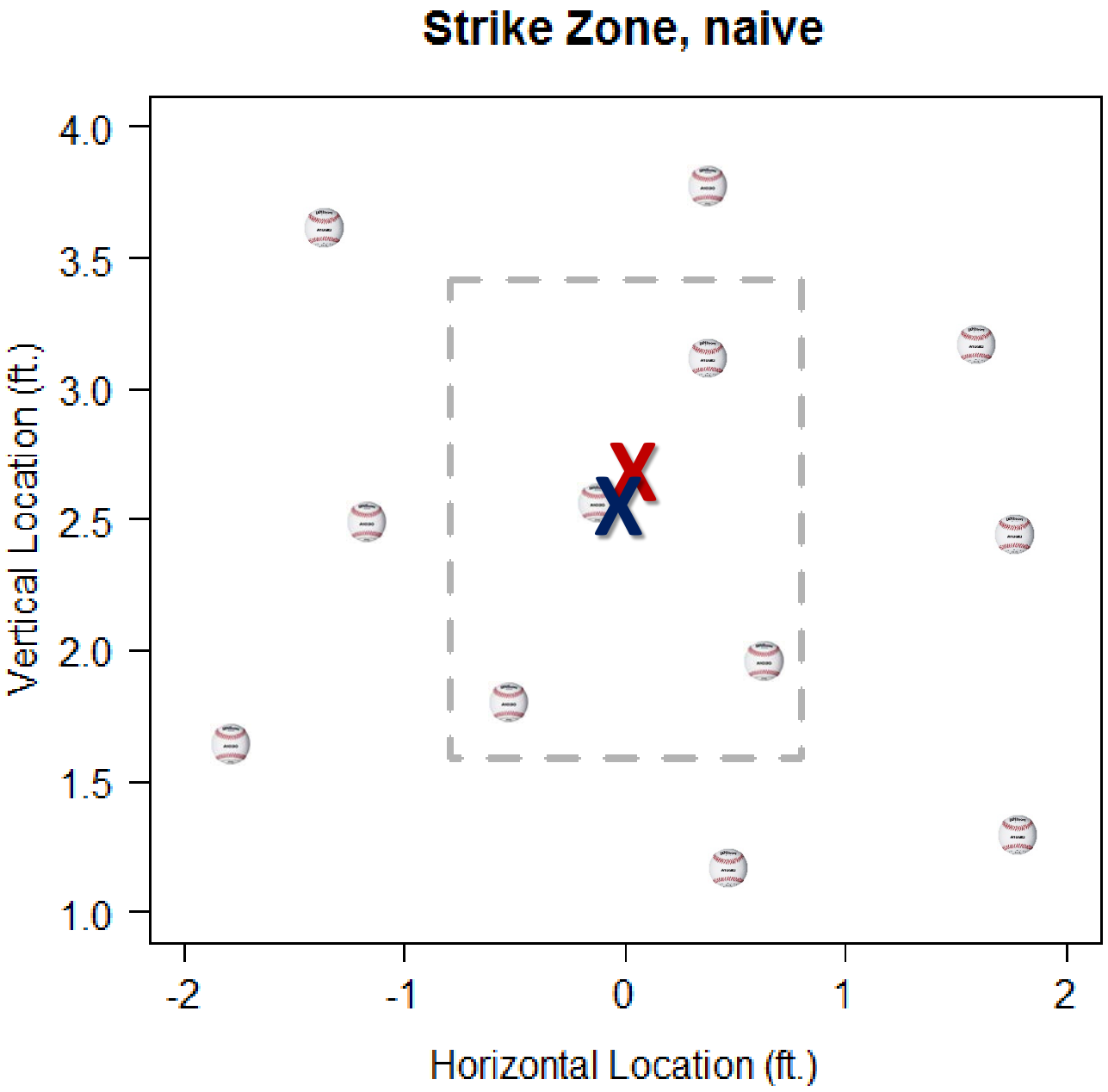
- **Deviation in measurement that is consistent in direction and magnitude**
- **Result from fixed differences in types of individual respondents (e.g., personality or experience or biological differences)**
  - **Drift in measurement in one direction over time**
  - **People respond to an irrelevant component of complex stimulus materials in the same way regardless of the other relevant components**

Validity

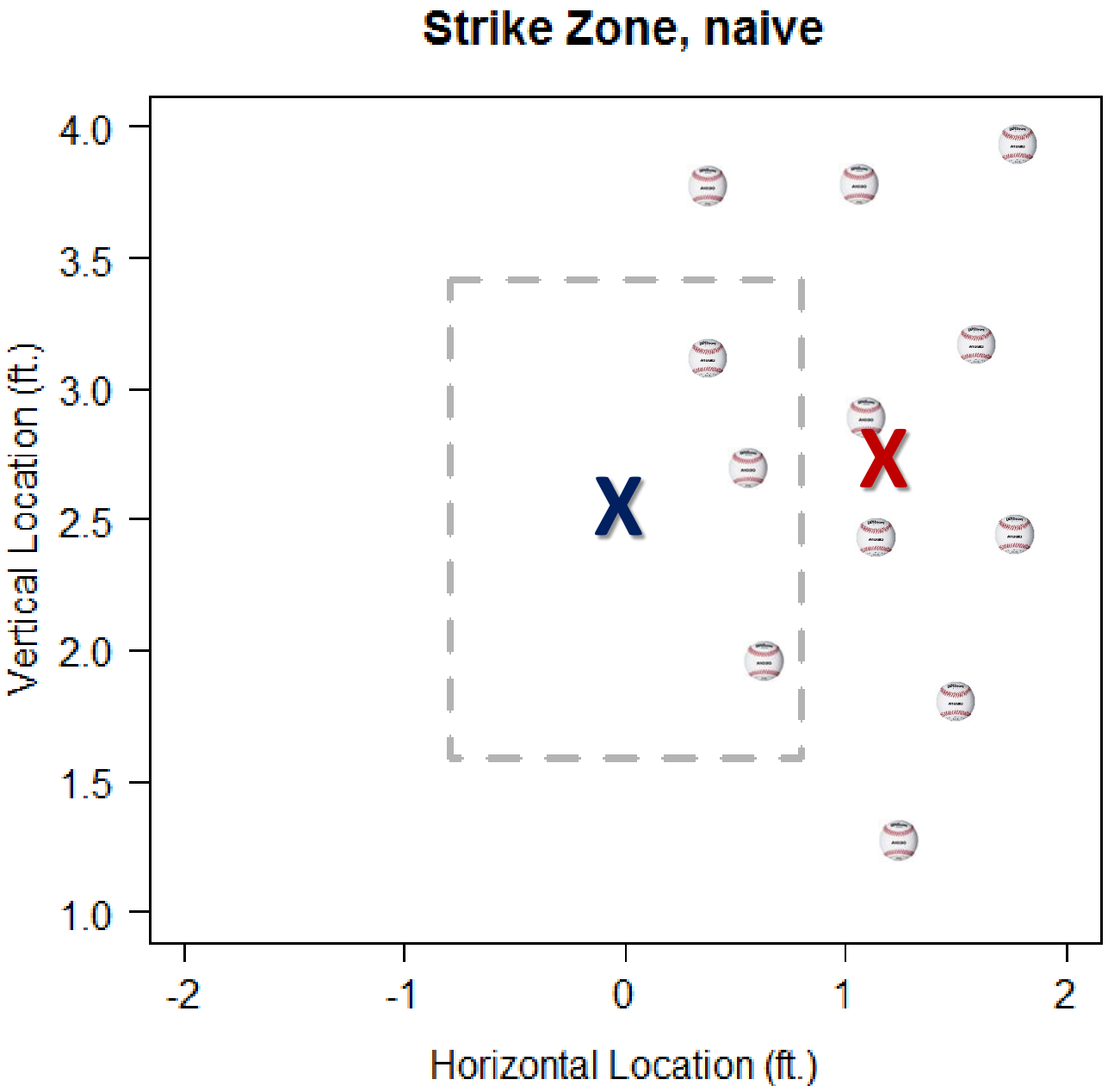
Absence of systematic error

- **Measurement is consistent in direction and magnitude**
  - **scores distribute around the true parameter**
- **Controls fixed differences in types of individual respondents (e.g., personality or experience or biological differences) as they influence the relevant behavior**
- **Absence of drift in measurement over time**
- **Control response to irrelevant components of complex stimulus materials**

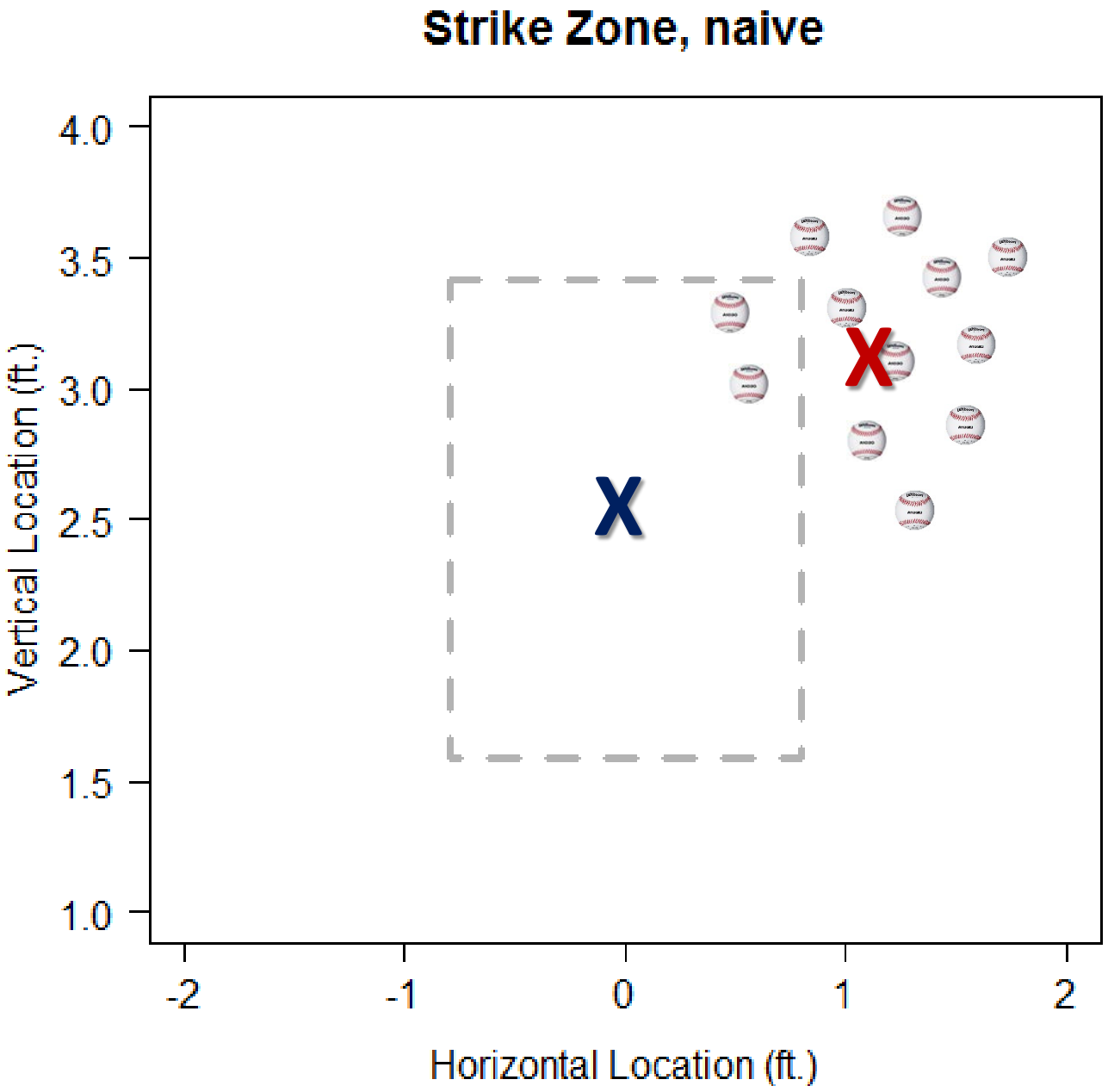
High Random Error – Low Systematic Error



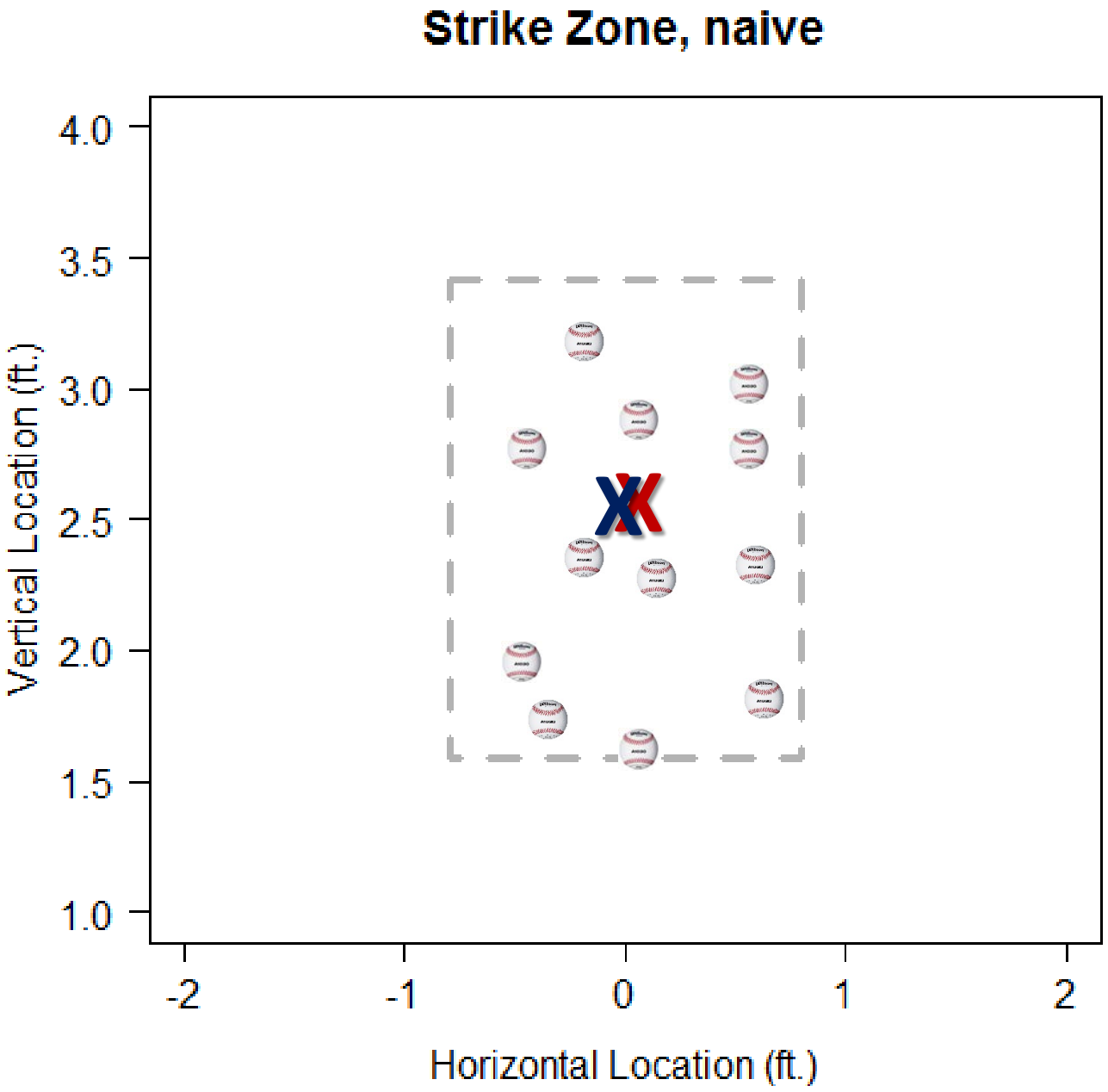
High Random Error – High Systematic Error



Low Random Error – High Systematic Error



Low Random Error – Low Systematic Error



Basic Concepts

How to tell if a measure is Valid?

Basic Concepts

- **Predictive Validity**
- **Statistical Significance and Effect Sizes**
- **Main Effects and Interactions**
- **Logistic Regression**

Basic Concepts

Predictive Validity

… is the extent to which an instrument predicts a criterion of interest

- **Criterion for the YLS/CMI is failure in the juvenile justice system**

Basic Concepts

Predictive Validity

- **Higher levels of risk on the YLS/CMI should be associated with higher rates of failure**
- **Lower levels of risk should be associated with lower rates of failure.**

Basic Concepts

Effect Size

… is the strength of the relationship between the instrument and the criterion.

- The effect size for the YLS/CMI is the strength of the relationship between YLS scores and failure in the juvenile justice system.

Basic Concepts

Effect Sizes

… one common measure of effect size is the point-biserial correlation coefficient , "*r*"

- **r ranges from -1.00 to 1.00**
- **Positive numbers indicate increases in risk are associated with increases of failure**

Basic Concepts

Effect Sizes

… the value of r between 0 and 1 Indicates the strength of the effect size

- **Small effect size:** $0 < r \leq .10$
- **Medium effect size:** $.10 < r \leq .35$
- **Large effect size:** $.35 < r \leq .50$
- **Very large effect size:** $.50 < r \leq 1.00$

Some Common Effect Sizes

Independent Variable	Dependent Variable	Sample Size	r as effect size
Vietnam Veteran Status	Alcohol Problems	4,462	.44
Cigarette Smoking	Lung Cancer	1,385	.40
Psychotherapy	Mental Health	1,111	.38
Beta Carotene (Cancer Prevention)	Death	19,133	.20

Effect sizes at .20 and above show meaningful relationships

Basic Concepts

Statistical Significance

… measures the probability of obtaining an effect size in a sample that is greater than 0 by chance alone.

- Convention: if $p < .05$ (5 out of 100), we accept it as statistically significant

Basic Concepts

Main Effect

… refers to the relationship between one predictor (here, the YLS/CMI score or level) and one outcome factor (here, failure in the criminal justice system).

Basic Concepts

Interaction Effect

… refers to *moderation* or the extent to which the effect of one variable depends upon the level of a second variable

Example: an interaction between sex of the youth and YLS score in predicting failure

- **Does the YLS so a better job of predicting failure for boys than for girls? (We hope not!)**

Basic Concepts

Logistic Regression

… predicts the outcome of a binary criterion (i.e., failure v. success) based on one or more predictor variables (e.g., possible time youth was in the system, YLS/CMI scores, gender and race).

Basic Concepts

Logistic Regression

… **calculates the optimal weights for each predictor variable (Beta's), effect sizes for each predictor variable (Odds ratios – converted to r's) and tests the statistical significance of the predictors (with the Wald and Chi-square statistics).**

Has anyone studied the validity of the YLS before?

The results of meta-analyses measure the strength of the relationship between the predictors (LSI criminogenic scales) and an outcome measure (recidivism) across multiple studies.

Olver et al. (2014) -- 128 studies of the LSI scales world wide:

YLS/CMI Effect sizes (*k* = 36 studies)

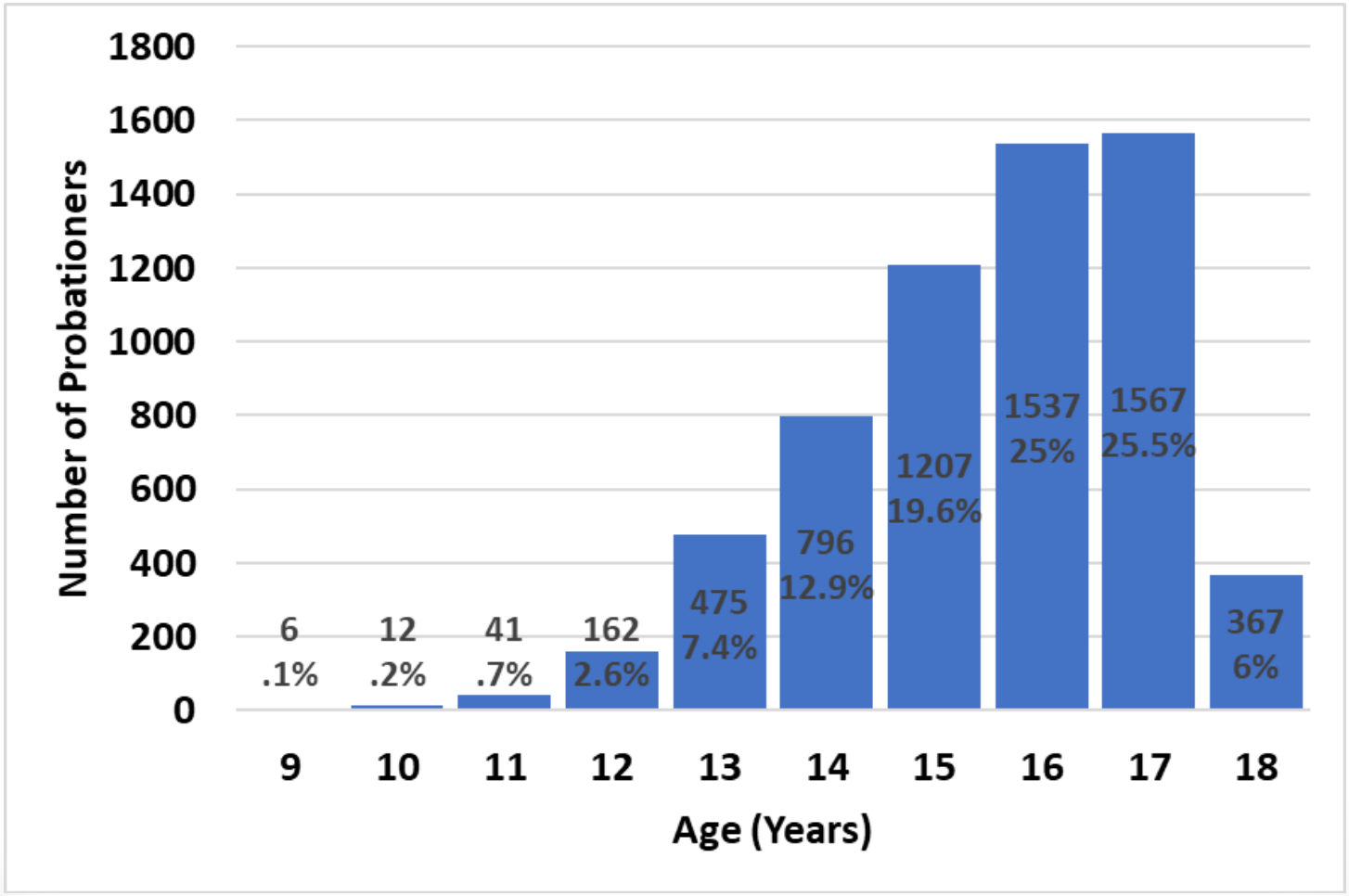
- **Overall: *r* = .25**
- **Canada: *r* = .33**
- **Outside North America: *r* = .28**
- **United States: *r* = .22**

YLS/CMI Validity Study in Nebraska !

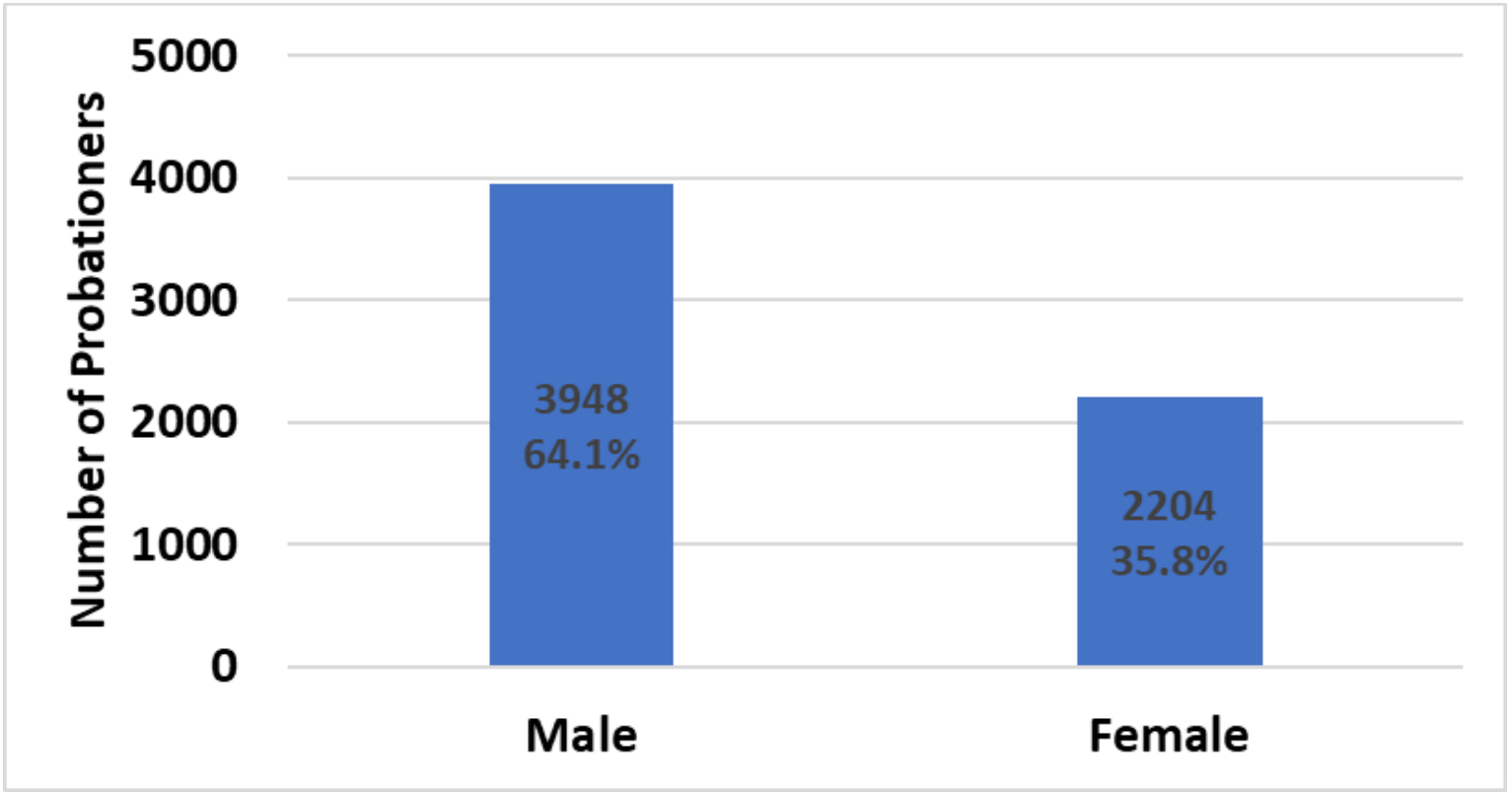
Sample
(from Nebraska Probation)

- **6,158 individual juvenile probationers (one record per child), each of whom had an index YLS/CMI assessment (i.e., the first one within our time frame) between May 24, 2007 and November 11, 2015.**

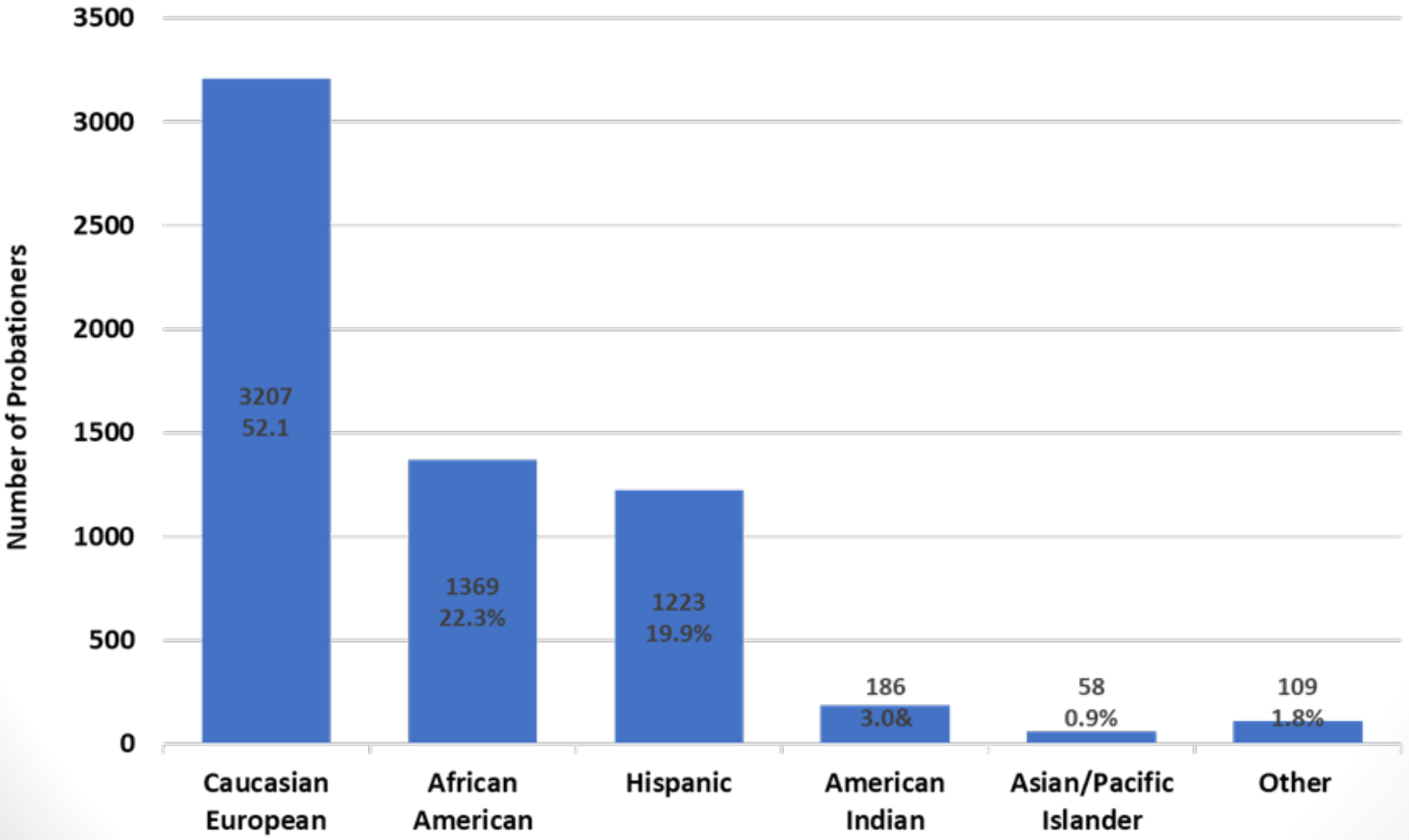
Youth's Age at First YLS/CMI Assessment Date (*M* = 15.5 years old)



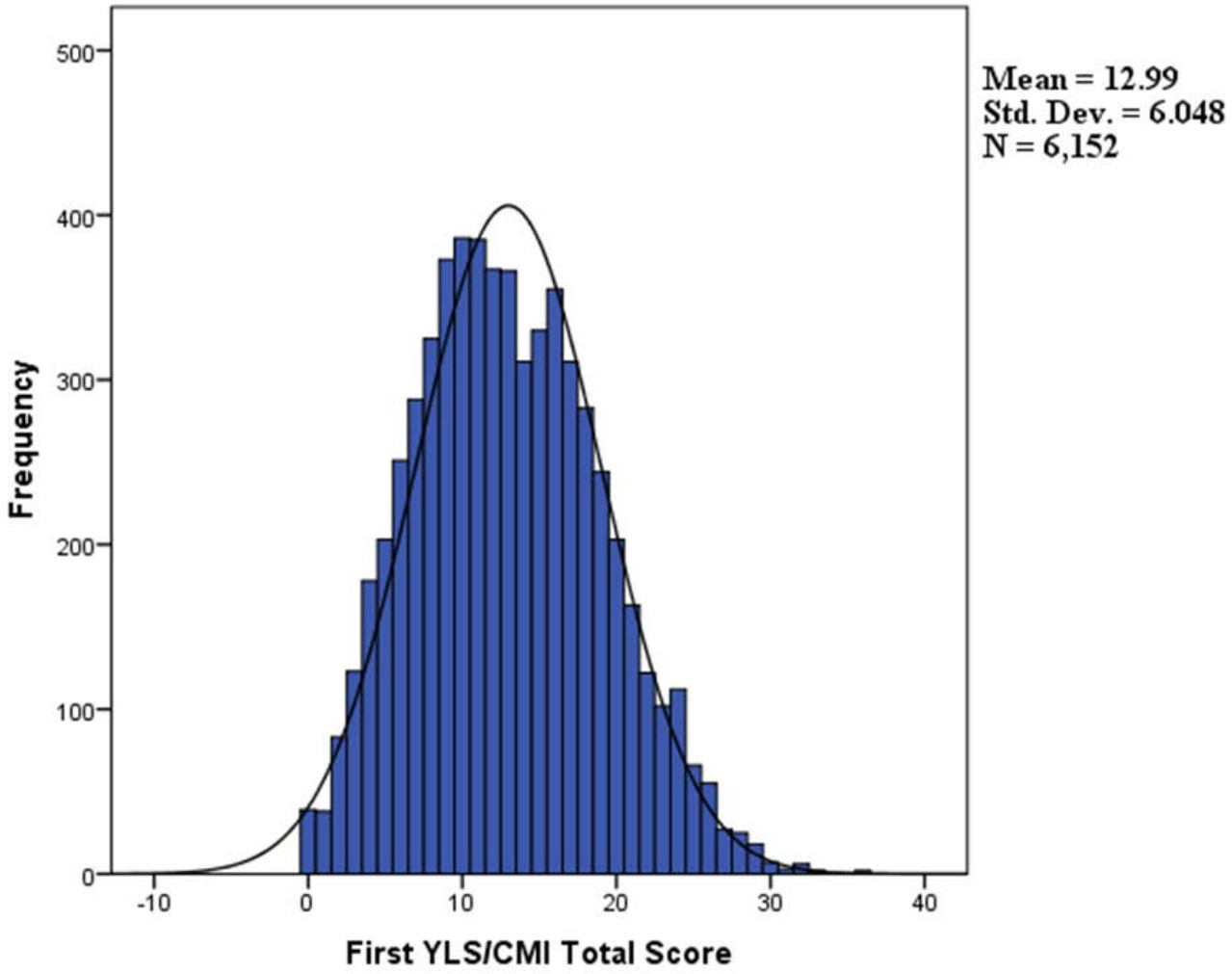
Gender of Youth Included in the Sample



Self-reported Race and Ethnicity Breakdown of the Youth Included in the Sample



Distribution of YLS/CMI Scores for all the Youth Included in the Sample

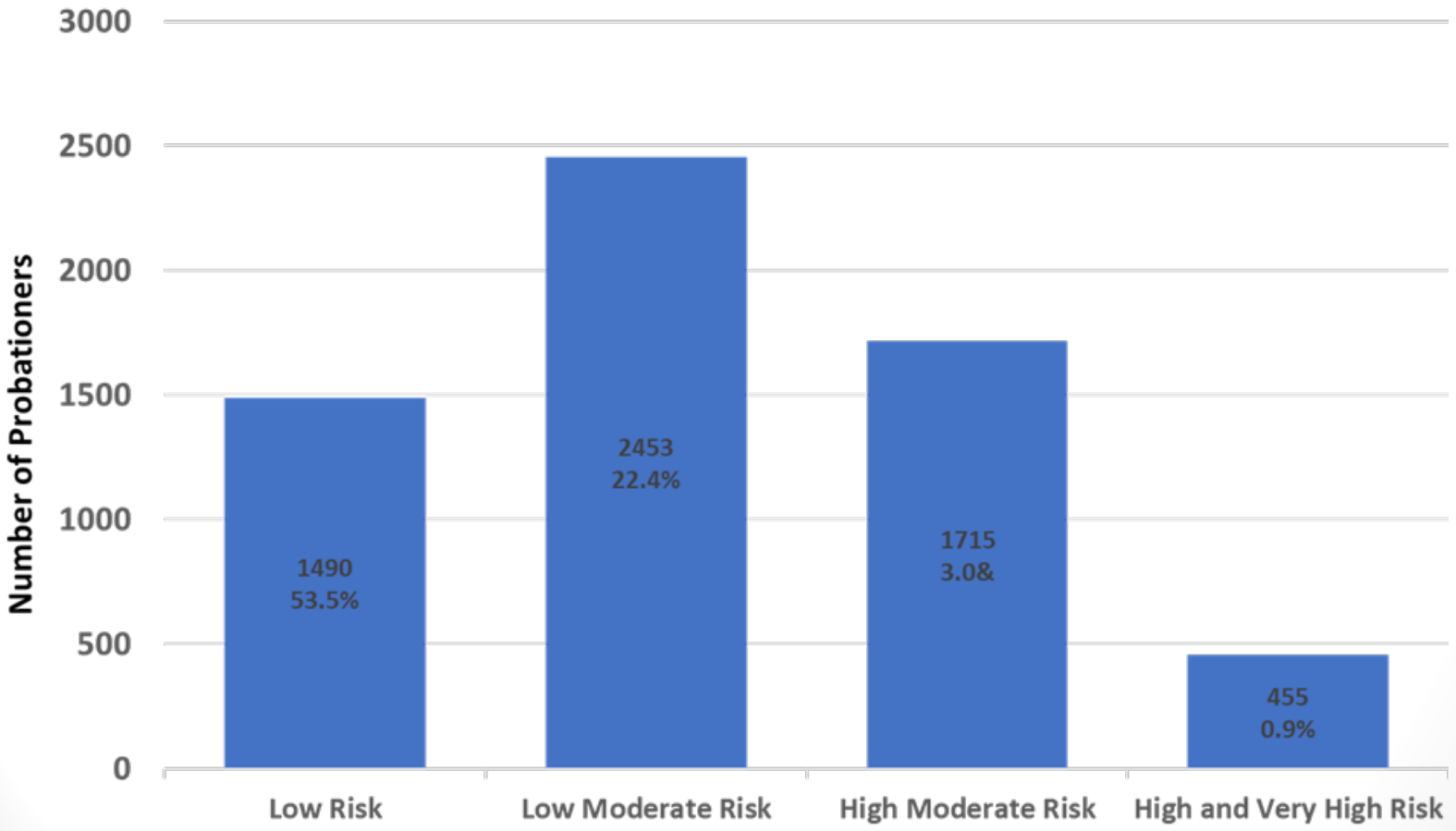


YLS/CMI Levels of Risk

In Nebraska, total score places youth in one of four categories for future risk for continued criminal behavior:

- **Low (0 to 8)**
- **Low Moderate (9 to 15)**
- **High Moderate (16 to 22)**
- **High (23 to 34)**
- **Very High (35 to 42) – there were only 2**

YLS/CMI Total Risk Levels for all Youth Included in the Sample



Validity Results: Main Effects

- **Success:** Youth with a successful first disposition and never returned to probation (success and no recidivism).

- **Failure:** Youth with an unsuccessful first disposition and/or returned to probation (unsuccessful and or recidivated).

Note: There are other ways to define success and failure (e.g., returned but with a successful disposition)

Predictive Validity of the YLS/CMI Total Score for Success Outcome – Predicting Failure (N=5782)

Predictor	Beta	S.E.	Wald	d.f.	O.R.
Possible Time in System	.0001	.000	7.846*	1	1.000
YLS Total Score	.101	.005	430.223**	1	1.106
Constant	-1.512	.080	358.578**	1	.220

Note: Model χ^2 (2) =478.527, $p < .001$; Nagelkerke $R^2 = .105$; $r = .29$; *$p < .01$. **$p<.001$.

***r* = .29**

Remember meta-analysis r = .22 in the rest of the U.S.

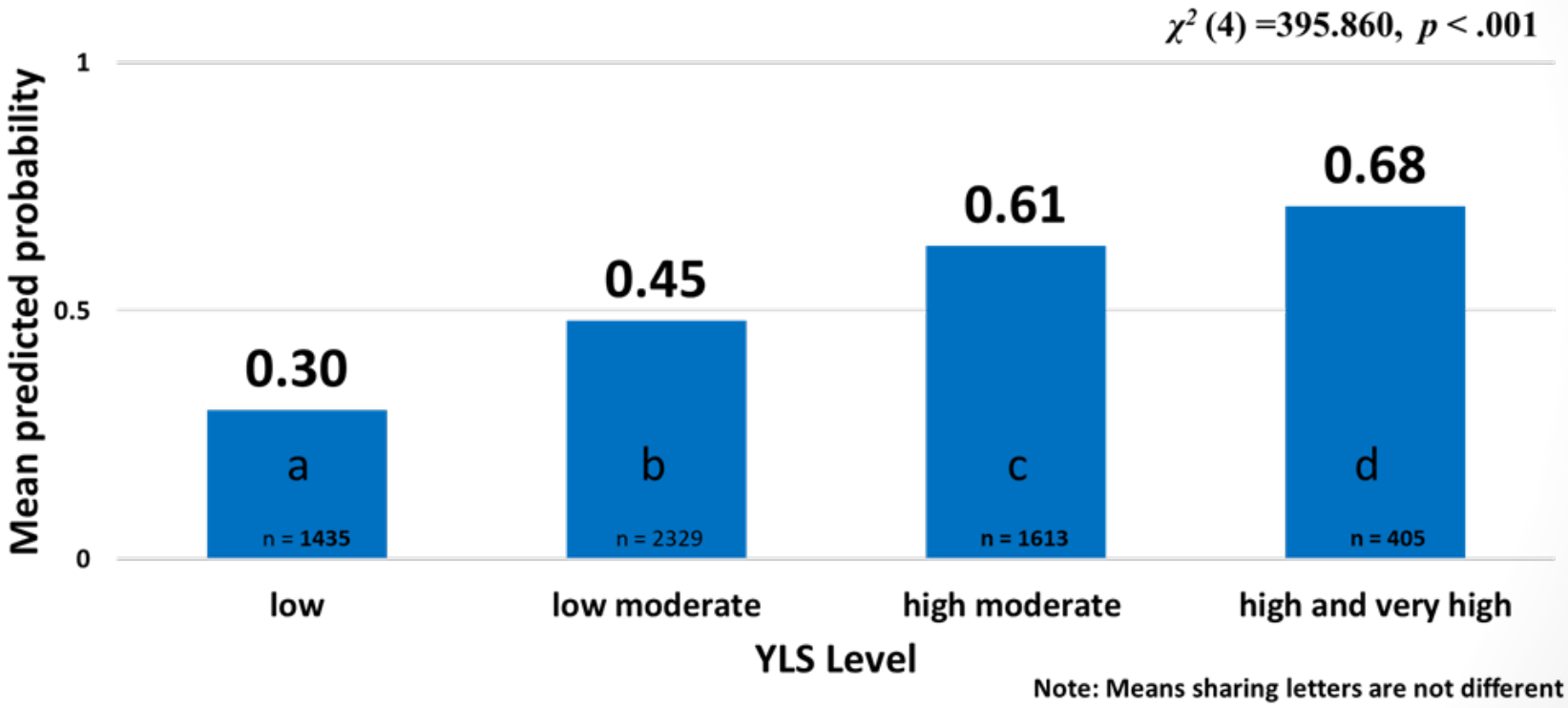
Predictive Validity of the YLS/CMI Risk Level for Success Outcome – Predicting Failure (N=5782)

Predictor	Beta	S.E.	Wald	d.f.	O.R.
Possible Time in System	.000	.000	5.572*	1	1.000
YLS/CMI Risk Level			369.802**	3	
Low Moderate vs. Low	.681	.071	90.933**	1	1.975
High Moderate vs. Low	1.338	.077	298.649**	1	3.810
High and Very High vs. Low	1.646	.122	183.215**	1	5.188
Constant	-.958	.069	191.379**	1	.384

Note: Model χ^2 (4) =395.860 $p < .001$; Nagelkerke $R^2 = .088$; $r = .26$; *$p < .05$, **$p < .001$

$r = .26$

Mean Probability of Failure at Each YLS/CMI Risk Level for the Success Outcome – Predicting Failure (N = 5782)



Validity Results: Interactions

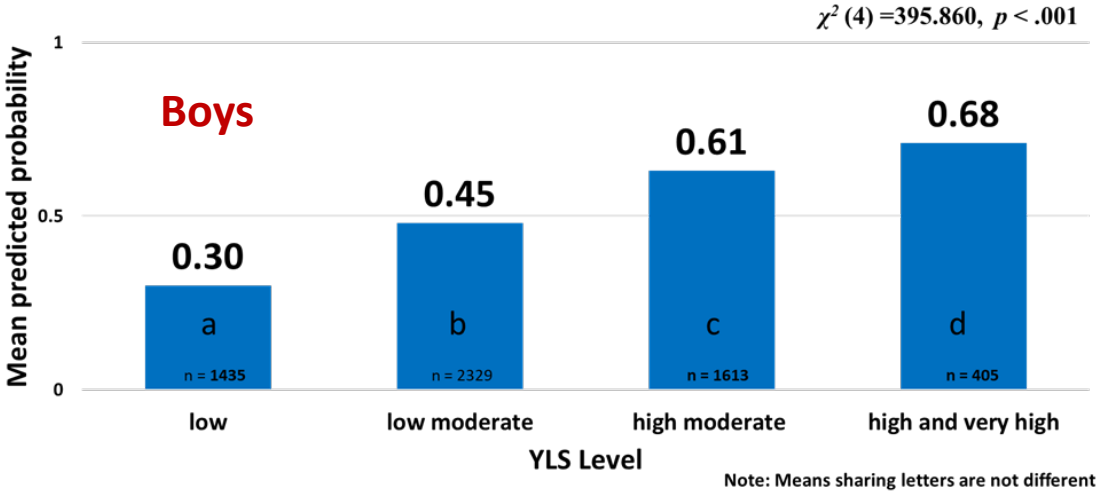
- **Moderation:** **Does the predictive validity of the YLS/CMI in Nebraska vary by gender or by minority-majority status?**

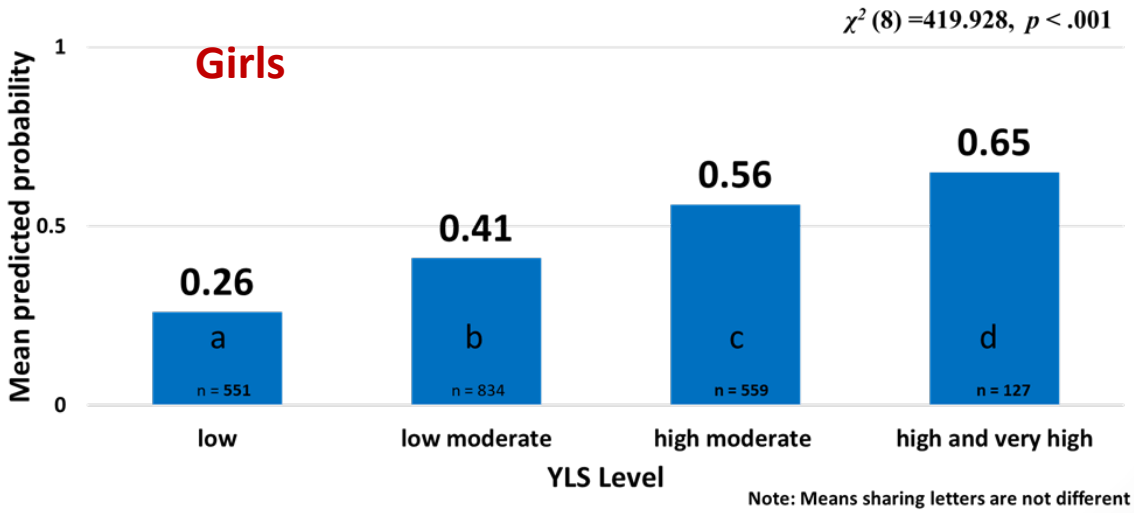
Effects of Gender, YLS/CMI Total Risk Score and their Interaction on Success Outcome – Predicting Failure (N = 5782)

Predictor	Beta	S.E.	Wald	d.f.	O.R.
Possible Time in System	.000	.000	8.086**	1	1.000
YLS Total Score	.099	.006	270.800**	1	1.104
Gender	-.331	.144	5.282*	1	.718
Gender * YLS Total Score	.004	.010	.168	1	1.004
Constant	-1.393	.094	218.501**	1	.248

Note: Model χ^2 (4) =502.114, $p < .001$; Nagelkerke $R^2 = .110$; $r = .005$; *$p < .05$. **$p<.01$.

Mean Probability of Failure at Each YLS/CMI Risk Level for Boys (N = 3711) and Girls (N = 2071)



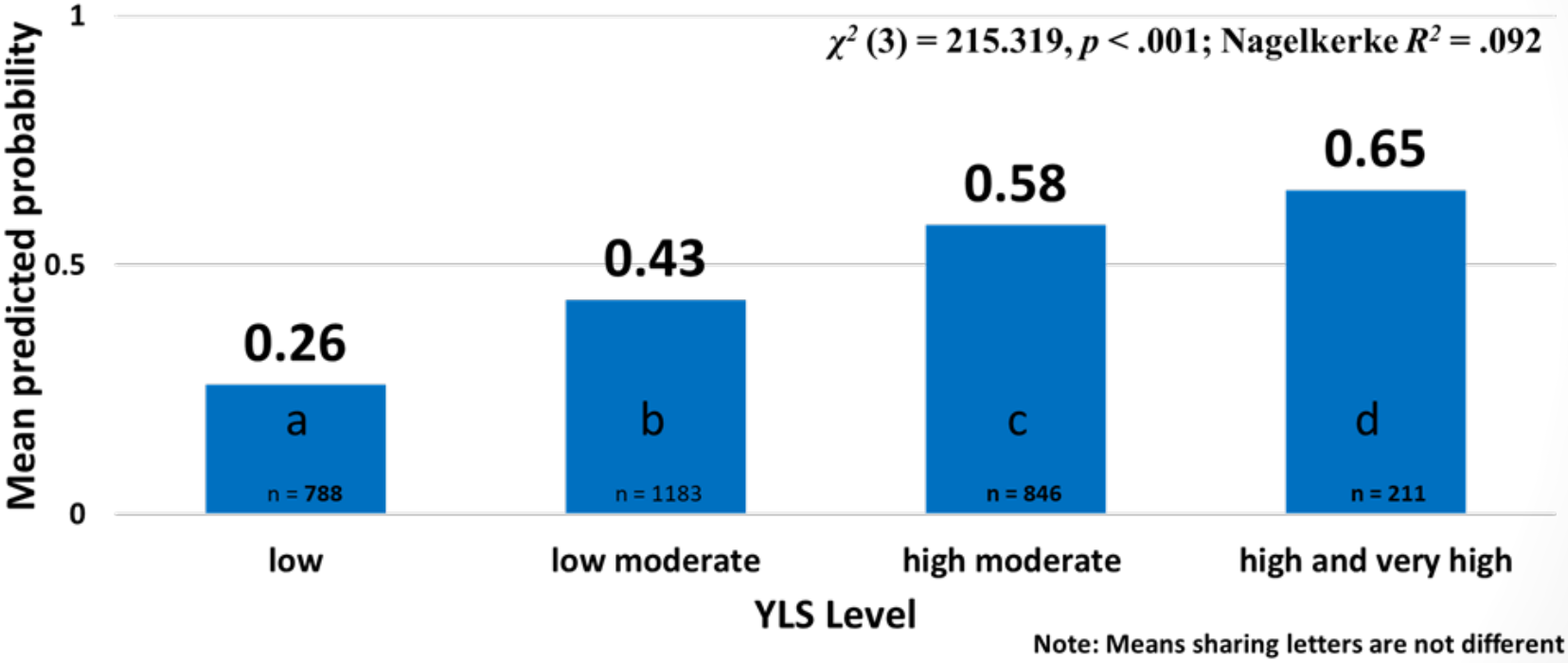


Effects of Race/Ethnicity, YLS/CMI Risk Score and their Interactions on Failure (N = 5280)

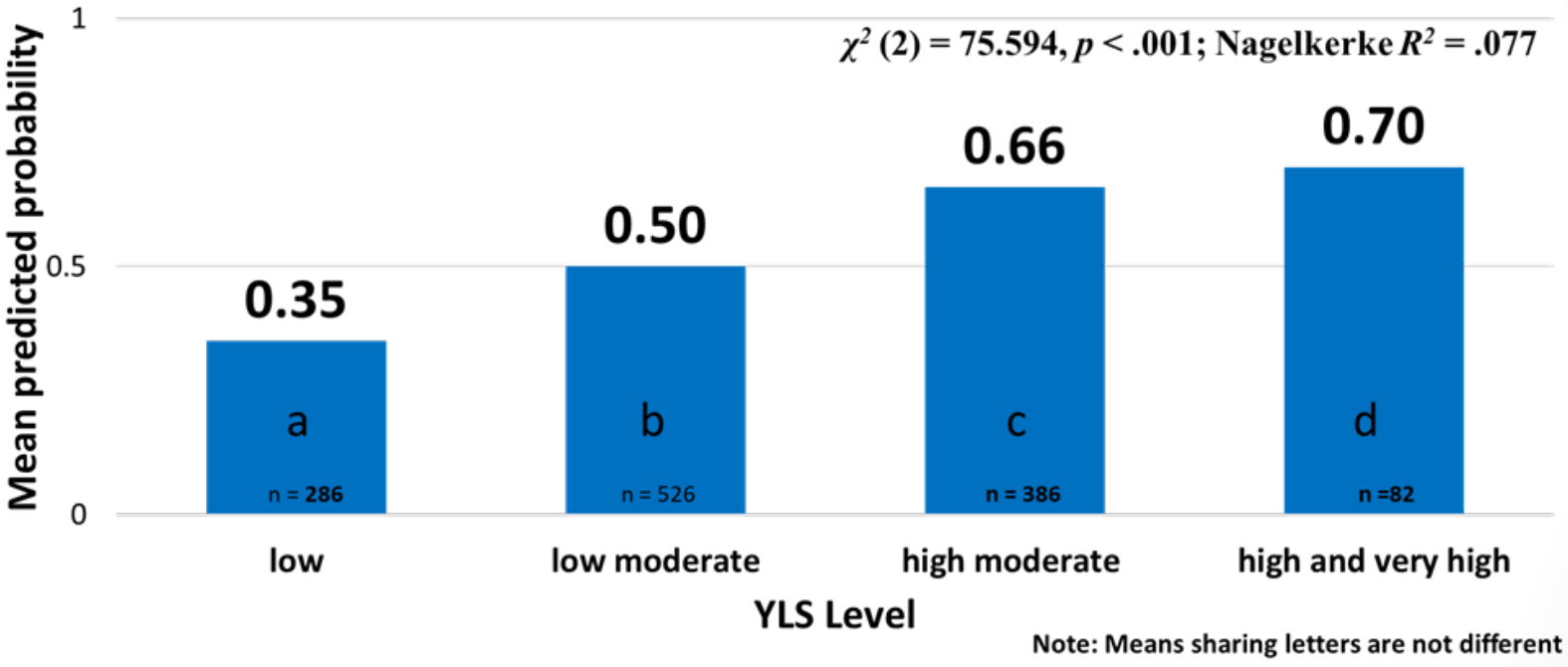
Predictor	Beta	S.E.	Wald	d.f.	O.R.
Possible Time in System	.000	.000	6.989**	1	1.000
YLS Total Score	.100	.007	225.692***	1	1.105
Minority Status			3.869^{ns}	2	
White v. Black	.336	.176	3.660^{ns}	1	1.400
White v. Hispanic	.013	.190	.005^{ns}	1	1.013
Minority Status * YLS Total Score			1.294^{ns}	2	
White v. Black * YLS Total Score	-.001	.012	.012^{ns}	1	.999
White v. Hispanic * YLS Total Score	.014	.014	1.136^{ns}	1	1.015
Constant	-1.617	.103	244.561***	1	.198

Note: Model χ^2 (6) =476.833, $p < .001$; Nagelkerke $R^2 = .113$; *$p < .05$. **$p<.01$, $p < .001$.

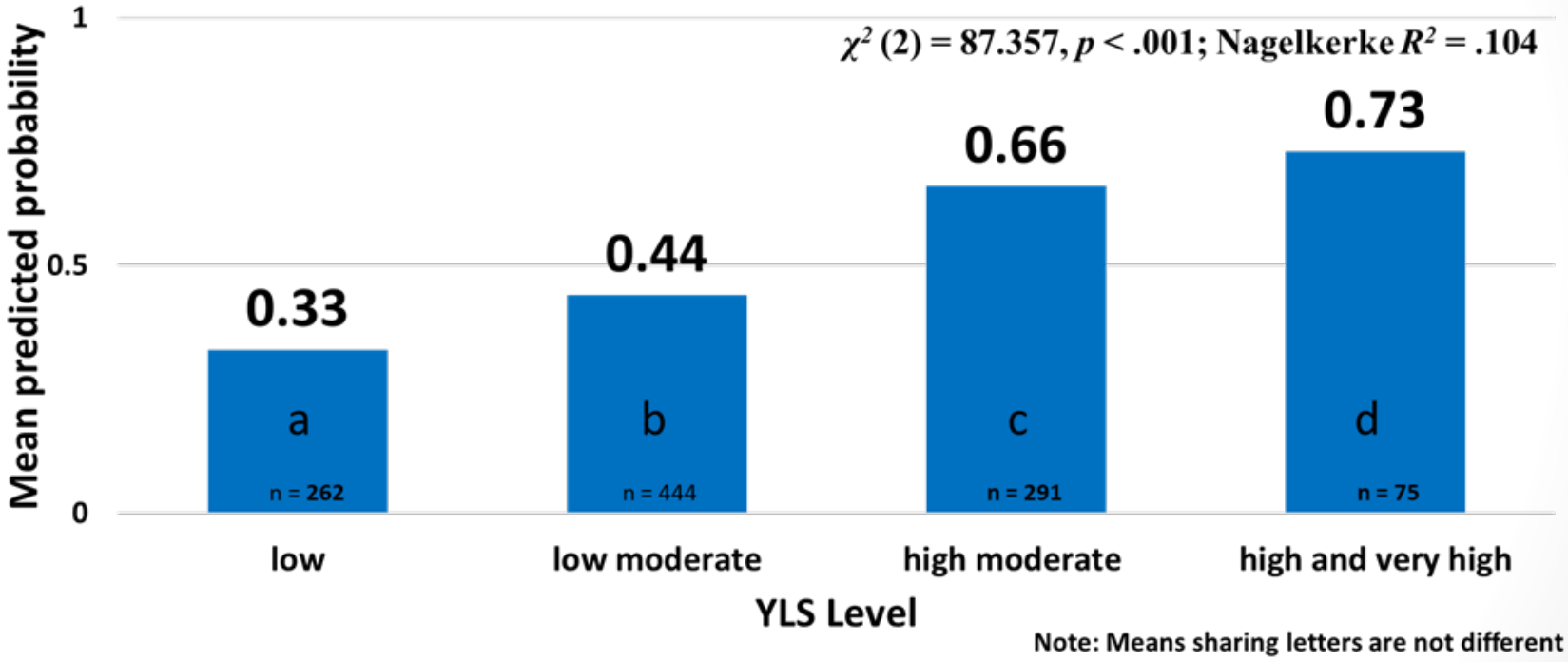
Mean Probability of Failure at Each YLS/CMI Risk Level for European Caucasian Youth (N = 3028)



Mean Probability of Failure at Each YLS/CMI Risk Level for African American Youth (N = 1280)



Mean Probability of Failure at Each YLS/CMI Risk Level for Hispanic Youth (N = 3028)



Conclusions:

1. **The YLS/CMI demonstrates validity with respect to predicting failure in the juvenile justice system.**
   - **Continuous scale *r* = .29**
   - **Risk levels show significant step function in expected direction**

Conclusions:

2. **The YLS/CMI shows no evidence of disparate impact in the way it predicts failure by gender.**
   - **Boys are significantly higher on failure than girls**

Conclusions:

3. **The YLS/CMI shows no evidence of disparate impact in the way it predicts failure by minority status.**

4. **Using risk level and not risk score as a predictor**
   - **African Americans and Hispanics are somewhat more likely to fail than are European Americans**

Thank you for your time and patience!

Effects of Race/Ethnicity, YLS/CMI Risk Level and their Interactions on Failure (N = 5280)

Predictor	Beta	S.E.	Wald	d.f.	O.R.
Possible Time in System	.000	.000	4.820*	1	1.000
YLS/CMI Risk Level			200.850***	3	
Low Moderate vs. Low	.756	.100	56.930***	1	2.130
High Moderate vs. Low	1.370	.107	163.602***	1	3.934
High and Very High vs. Low	1.691	.166	103.637***	1	5.427
Minority status			9.491**	2	
White vs. Black	.424	.148	7.802*	1	1.513
White vs. Hispanic	.317	.155	4.190*	1	1.372
Minority status * YLS/CMI Risk Level			4.493^{ns}	6	
White vs. Black * YLS * Low Moderate vs. Low	-.145	.182	.634^{ns}	1	.865
White vs. Black * YLS * High Moderate vs. Low	-.094	.196	.229^{ns}	1	.911
White vs. Black * YLS * High/V. High vs. Low	-.231	.317	.532^{ns}	1	.794
White vs. Hispanic * YLS * Low Moderate vs. Low	-.269	.191	1.988^{ns}	1	.764
White vs. Hispanic * YLS * High Moderate vs. Low	.031	.210	.022^{ns}	1	1.032
White vs. Hispanic * YLS * High/V. High vs. Low	.055	.336	.027^{ns}	1	1.056
Constant	-1.123	.090	155.943***	1	.325

Note: Model χ^2 (12) =404.632, $p < .001$; Nagelkerke $R^2 = .097$; $r = .26$; *$p < .05$, **$p < .01$, ***$p < .001$