Externalizing behavior and emotion dysregulation are indicators of transmissible risk for substance use disorder

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Aims: This longitudinal study determined whether TLI has incremental validity for predicting SUD beyond commonly measured psychological indicators of risk.

Methods: TLI and measures of executive cognitive capacity, emotion dysregulation and externalizing disturbance were administered to boys at ages 10–12 and 16. SUD outcome determined at age 22 was assessed as (1) any SUD, (2) the number of drug-specific SUDs, and (3) SUD severity.

Results: TLI predicted SUD beyond the contribution of measures of emotion dysregulation, executive cognitive capacity and externalizing disturbance. The association of emotion dysregulation and externalizing behavior at ages 10–12 and 16 with SUD at age 22 was also reduced to non-significance after controlling for transmissible risk measured by TLI.

Conclusions: TLI's incremental validity beyond these latter indicators of risk points to its utility for identifying vulnerable youths requiring intervention.

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Keywords: Vulnerability, Substance use disorder, Children, Risk, Family history

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Abstract

Background: Psychological items discriminating children of fathers diagnosed with an illicit drug-related substance use disorder and normal controls are indicators of a unidimensional construct termed transmissible liability index (TLI) (Vanyukov et al., 2009). TLI is a highly heritable (Vanyukov et al., 2009; Hicks, Iacono, McGue, 2012) and valid (Vanyukov et al., 2009; Hicks et al., 2009; Kirisci et al., 2013a) measure of childhood liability to substance use disorders (SUDs).

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Methods: TLI and measures of executive cognitive capacity, emotion dysregulation and externalizing disturbance were administered to boys at ages 10–12 and 16. SUD outcome determined at age 22 was assessed as (1) any SUD, (2) the number of drug-specific SUDs, and (3) SUD severity.

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Conclusions: TLI's incremental validity beyond these latter indicators of risk points to its utility for identifying vulnerable youths requiring intervention.

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Indeed, the order of drug use initiation specified in the “gateway hypothesis” (Kandel & Yamaguchi, 2002) is less informative than TLI for modeling SUD development between childhood and adulthood (Tarter et al., 2012a).

Investigations exploring the utility of TLI in the elucidation of SUD etiology have yielded promising results. For example, youths scoring high on TLI exhibit a linear increase in risk following the first cannabis use that subsequently culminates in cannabis disorder, whereas youths who score low on TLI exhibit no change in risk after onset of consumption (Kirisci, Tarter, Ridenour, Reynolds, & Vanyukov, 2013b). The extent to which this increment in severity reflects a differentially strong reinforcing experience following substance use among high-risk youths or the influence of substance use peers on socialization remains to be determined. Notably, non-normative socialization mediates the association between TLI scores in childhood and SUD in adulthood (Tarter et al., 2011) and the TLI score in childhood predicts elevated testosterone level and attenuated cortisol reactivity in mid-adolescence presaging SUD in adulthood (Tarter et al., 2013) suggesting that both pharmacological and social factors potentiate transmissible risk leading to development of SUD. In sum, the emerging research demonstrates the utility of the TLI for elucidating the mechanisms and etiological pathways to SUD.

Whereas these findings indicate that TLI measures transmissible risk for SUD and is heuristic for researching etiology, the relationship between TLI and psychological processes commonly reported to contribute to SUD liability has not been investigated. Accordingly, this study evaluated the association between TLI and psychological processes most often implicated in SUD risk, pertaining to cognition, emotion and behavior, namely executive cognitive capacity, emotion dysregulation and externalizing disturbance. It was hypothesized that these latter variables are facets of SUD liability measured by TLI. Hence, the hypothesis was tested that TLI in childhood and adolescence not only accounts for SUD liability has not been investigated. Accordingly, this study evaluated the association between TLI and psychological processes most often implicated in SUD risk, pertaining to cognition, emotion and behavior, namely executive cognitive capacity, emotion dysregulation and externalizing disturbance. It was hypothesized that these latter variables are facets of SUD liability measured by TLI. Hence, the hypothesis was tested that TLI in childhood and adolescence not only accounts for

### Table 1

Baseline (age 10–12) Characteristics of retained and attrited segments of the sample.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Retained (n = 305)</th>
<th>Attrited (n = 185)</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>School grade</td>
<td>4.57</td>
<td>1.12</td>
<td>4.51</td>
<td>1.01</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>41.95</td>
<td>13.50</td>
<td>38.89</td>
<td>12.84</td>
</tr>
<tr>
<td>Full Scale IQ</td>
<td>110.30</td>
<td>15.82</td>
<td>103.58</td>
<td>15.21</td>
</tr>
<tr>
<td>n</td>
<td>232</td>
<td>76.1</td>
<td>137</td>
<td>74.1</td>
</tr>
<tr>
<td>White</td>
<td>65</td>
<td>21.3</td>
<td>40</td>
<td>21.6</td>
</tr>
<tr>
<td>Black</td>
<td>8</td>
<td>2.6</td>
<td>8</td>
<td>4.3</td>
</tr>
<tr>
<td>Other</td>
<td>147</td>
<td>48.2</td>
<td>94</td>
<td>50.8</td>
</tr>
<tr>
<td>SUD + parent</td>
<td>158</td>
<td>51.8</td>
<td>91</td>
<td>49.2</td>
</tr>
</tbody>
</table>

Boys were excluded from the study if they had a lifetime history of psychosis, chronic illness, neurological disability, uncorrectable sensory handicap, Full Scale IQ below 80 on the WISC-III–R, or signs of fetal alcohol effects determined upon physical examination conducted by a trained registered nurse.

### 2.2. Measures

#### 2.2.1. Transmissible liability index (TLI) (ages 10–12 and 16)

TLI was derived using a previously described multistage procedure (Vanyukov et al., 2003a,b). First, investigators at the Center for Education and Drug Abuse Research (CEDAR) catalogued the psychological traits (N = 34) most frequently reported in the empirical literature to be associated with risk for SUD. Next, items (N = 441) from a large battery of psychological questionnaires and psychiatric interviews administered to the parents, teachers and the boys contained in CEDAR’s database were assigned to these traits. Exploratory factor analysis (EFA) was performed on the items in each provisional trait. Items having loading >.4 were retained and submitted to confirmatory factor analysis (CFA). The constructs that satisfied the criterion of unidimensionality were contrasted between boys having SUD + and SUD — fathers. The items contained in the thirteen constructs that discriminated the sons in these two groups were then submitted to EFA and further pruning if they had loading below .4. CFA was conducted on the remaining items to verify the unidimensionality of the resulting construct. Lastly, item response theory (IRT) was conducted to calibrate the items, estimating their item threshold and item discrimination parameters. The threshold parameter relates the probability of endorsing a particular characteristic (item) to severity of SUD liability whereas the discrimination parameter specifies the ability of the item to differentiate individuals according to severity of SUD liability. In sum, from a roster...
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