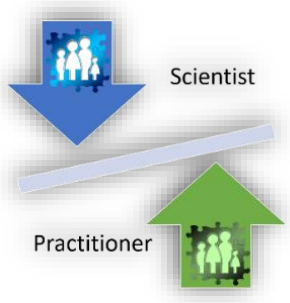
POWERED BY THE MINDS AT CHILD DEVELOPMENT INSTITUTE

RESEARCH BRIEF

SNAP® (Stop Now And Plan) is an evidence-based, gender sensitive, cognitive behavioural, multi-component and family-focused program developed in 1985 at Child Development Institute (CDI; formerly Earlscourt Child and Family Centre) in Toronto, Canada. It was initially started in conjunction with the Toronto Police Service with support from the Ontario Government to meet a service gap for young children in conflict with the law as a result of the Canadian Government raising the age of criminal responsibility from seven to twelve (1984). Today, SNAP is a children's mental health model designed specifically for children at risk for engaging in antisocial activities and/or experiencing disruptive behaviour problems at home, school, and in the community. For the past decade, SNAP has also worked at ensuring the model is culturally responsive and safe (in particular for Indigenous and Black and African Canadian children, families and communities). Evaluation of the SNAP model is a continuous process, and as part of SNAP's scientist-practitioner framework, research to inform and improve SNAP is an integral part of the model enhancement process and development.

The Scientist-Practitioner Model



The SNAP model utilizes a scientist-practitioner framework, which emphasizes the integration of science and practice in clinical programs. In essence, this means that research should directly inform and improve the clinical program in ways that are realistic and helpful, while also drawing on the experiences of clinicians to influence the course of research (Jones & Mehr, 2007). Thus, much of the research produced by CDI and licensed SNAP affiliate sites aim to either evaluate the effectiveness of SNAP, or make their implementation more efficient.

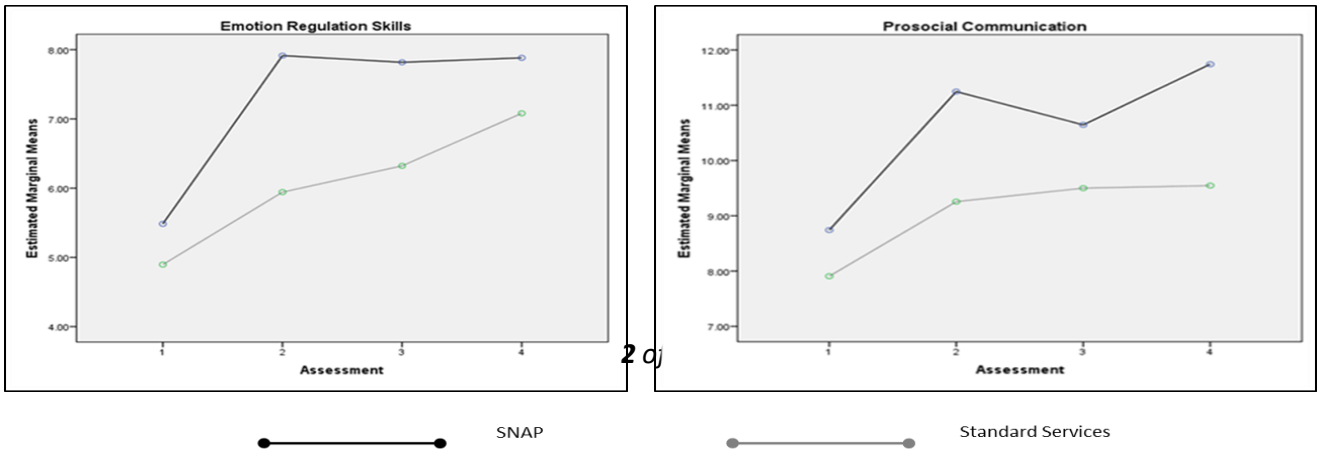
Historic Research – Evaluating the SNAP Program

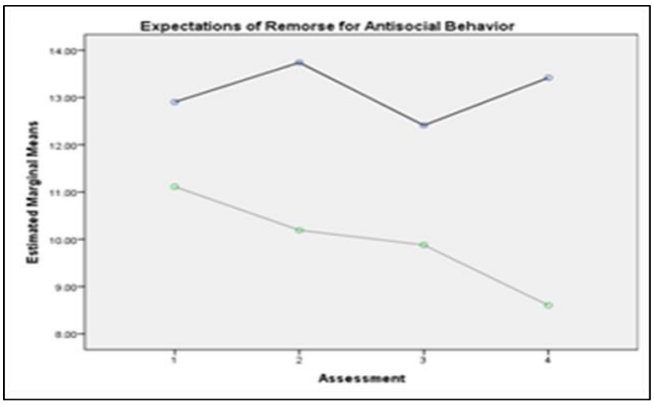
CDI has initiated several studies evaluating the effectiveness of SNAP. The first randomized controlled trial of SNAP revealed significantly reduced scores of both delinquent, externalizing, and internalizing behaviour, as measured by the Child Behavior Checklist (CBCL; ASEBA), as well

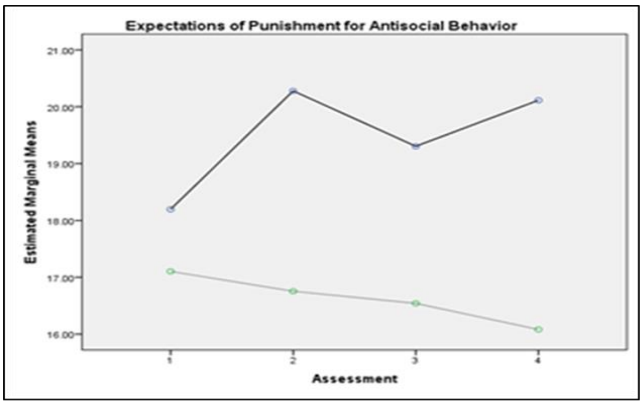
as improved child-parent relationship in children after completing SNAP compared to a control group. Crucially, the positive effects of the SNAP program were maintained at a 15-month follow-up (Day & Augimeri, 1996). Another randomized controlled trial further found significant reductions in the girl's aggression, rule-breaking, and conduct problems, as well as internalizing problems (measured by the CBCL), and relationship quality with parents (Pepler et al., 2010) – demonstrating that the SNAP Girls program effectiveness.

The largest 3rd party SNAP randomized controlled trial (RCT) was conducted at the University Pittsburgh by Burke & Loeber (2015). This study found that SNAP significantly reduced aggression, conduct problems, rule-breaking, and overall externalizing behaviour, depression and anxiety (as measured by the Child Behavior Checklist) and outperformed treatment as usual. In addition, SNAP reduced symptoms of oppositional defiant disorder (ODD) and attention deficit hyperactivity disorder (ADHD). Notably, treatment gains were maintained one year later.

In a follow-up study from the same team, the researchers analyzed the mechanisms that led to the beavhioural changes. Burke & Loeber (2016) found that SNAP treatment condition saw improvements in problem solving skills, prosocial behaviour, emotion regulation, and reduced parenting stress associated with difficult child behaviour – all of which predicted improvements on aggression. They also found that emotion regulation skills also predicted improvements in anxious/depressed outcomes for the SNAP children.







SNAP Standard Services

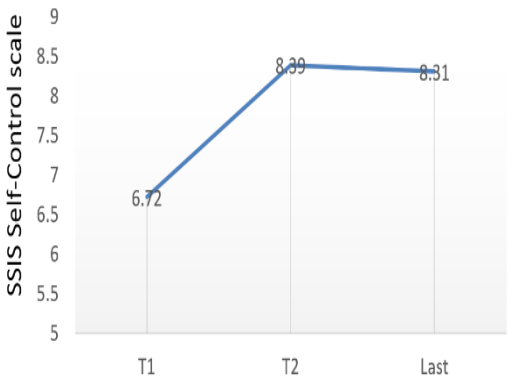
SNAP affiliate sites in Ontario and the US have reported similar decreases in rule-breaking, aggression, and conduct problems, along with increased social skills and emotion regulation in children completing the SNAP program (e.g., Lipman et al., 2008; SNAP Pittsburgh Steering Committee, 2011).

Several studies have also focused specifically on girls, and the evaluation of the SNAP Girls program. The first of this kind included all girls that had participated in the program since its inception in 1996 through to 2000. The study found significant decreases in externalizing behaviour and improved social skills between admission and follow-up at 6 and 12 months (Walsh et al., 2002). The authors noted that girls who remained in the clinical range after completing the program had higher scores on externalizing scales and higher co-morbidity, which highlights the need to address these complex interactions in treatment planning (Walsh et al., 2002).

Qualitative evaluations of the program have also been conducted. From interviews with 35 families, one study found that parents reported improvements in parenting skills and communication with their child, as well as overall improvements in the family relations (Lipman et al., 2011), clearly demonstrating the importance of including the parenting component of SNAP.

Recent Research

A recent study found significant increases in self-control (as measured by the Social Skills Improvement System, SSIS) in both boys and girls from the start of the program (T1) to six months later (T2), and these benefits were maintained at the last time point, approximately one year later (Augimeri et al., 2018). Another analyses (Walsh et al., 2018) that looked at SNAP boys and girls CBCL Scores split into race – White, Bi-Racial/Black, Other, and Not Identified (N=599; 2001-2013), children in all four race categories significantly improved in scores of rule-breaking, aggression, and externalizing scores.



SNAP is most beneficial for boys with severe conduct problems. A recent study by the team found that while SNAP-girls program for were equally effective in reducing conduct problems regardless of severity of symptoms, the SNAP-boys program was significantly more effective for boys with severe versus mild conduct problems. The study also showed that while boys and girls may show similar behaviours and severity of problems, the way I which these behaviours cluster together differs between the genders, and treatment planning, as well as treatment, for boys and girls must be different as a result (Smaragdi et al., 2020).

At the same time as this study came out, a less intensive version of SNAP, SNAP irritability (I-SNAP) was piloted. This spin-off program aimed at reducing milder forms of conduct problems, such as oppositional and irritable behavior (Derella et al., 2020). While the key facets of the original SNAP program remain, the I-SNAP program targets less severe behavioral problems with the specific focus on increasing frustration tolerance by means of emotion-focused coping strategies and relaxation. The initial results of the pilot study showed promising results in reducing oppositional and irritable symptoms (Derella et al., 2020), and may be an alternative to the original SNAP program form boys with less severe problems.

Long-term benefits of SNAP

To ascertain long-term benefits of the program, Augimeri et al. (2007) searched available criminal records for the participants in the original study and noted that number of criminal offences (obtained up to age 18) were almost halved for the children taking part in SNAP, relative to a less intensive treatment. In the most recent long-term follow-up [3rd wave of criminal outcome data; (N=551; boys N=276; girls N=275) SNAP graduates aged 12+ involved in treatment from 2001-2009), Donato and colleagues (2015) found that approximately **68% of the SNAP children will <u>not have any criminal justice contact</u>** by age 20.5. It was also found that more boys 21.7% (N=60) versus 9.1% of girls (N=25) had involvement with the criminal justice system. To put the above into perspective, typically research has found up to, 75% of children engaged in antisocial and/or delinquency are likely to continue on a serious violent and chronic pathway. The findings from

these studies clearly demonstrates the positive long-term effects of early intervention with SNAP. To further this point, an instrumental study by Farrington & Koegl (2015) showed that SNAP is estimated to save on average between $17-32 for every $1 spent and reduce crime by up to 33% (linked to an effect size of .4), emphasizing the lasting benefits of the program. These findings were further supported when Washington Institute for Public Policy (WSIPP) did an independent cost benefit analysis on SNAP that was issued in December 2018.

SNAP Cost Benefit Analysis:

Farrington & Koegl, 2015

Farrington & Koegl, 2015

- Average cost of SNAP = **$4,641**
- Average #crimes committed = **6.9**
- Estimated reduction in crime = **18 % (.2) - 33% (.4)**
- Estimated total savings = **$89,763 (.2) - $147,423 (.4)** **(effect size)**

An independent cost benefit analysis of SNAP conducted by the Washington Institute for Public Policy (WSIPP, December 2018) published the following findings:

$4.13	Benefits to cost ratio
$12,968	Benefits minus costs per family
Approximately $35,000	Savings over the life of a child
86%	Likelihood program will produce benefits greater than costs

Summary of SNAP Key Findings:

- Emotion regulation
- Self-control
- Problem-solving skills
- Pro-social communication
- Executive functioning
- Social competency
- School success

- Antisocial behaviour
- Rule breaking
- Depression
- Anxiety
- Police contact
- Disciplinary issues at school
- Parental distress

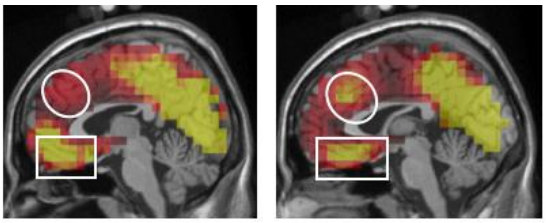
Putting the Scientist-practitioner Model into Practice

Other studies have focused on mediating factors that facilitates reductions in aggression and externalizing behaviour. For example, improved parent-child relationship was a significant predictor of improvements in externalizing behaviour (Granic et al., 2007). Similarly, significant increases in self-control was found to be a strong mediator in reducing externalizing behaviour in both boys

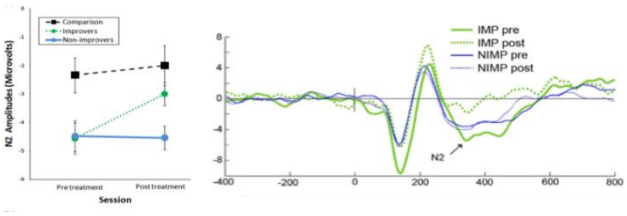
and girls (Augimeri et al., 2018). These studies are invaluable, as they may directly inform the SNAP model to strengthen certain aspects of the program.

SNAP and Neuroscience

The first studies to investigate biological markers of SNAP treatment success used electroencephalography (EEG) to measure prefrontal brain activation in children whose clinical scores improved, versus not improved, following completion of SNAP (and relative to a healthy control group). The authors found that all children taking part in SNAP had heightened activity in areas involved in emotion regulation at pre-treatment assessment. However, the children who displayed clinical improvement in externalizing scores at post-assessment had reduced brain activity, showing brain activity that was more similar to the healthy children (Lewis et al., 2008; Woltering et al., 2011). An additional study using these methods found that, specifically, theta-band brain activity was associated with improved self-regulation up to 12 months post-SNAP treatment (Woltering et al., 2015).



PRE 13-Week SNAP Group POST 13-Week SNAP Group



A recent study using magnetic resonance imaging (MRI) to investigate whether brain activation pre-SNAP treatment reliably predicted clinical improvement following SNAP (Byrd et al., 2018). While such an association was not found, it poses the question of whether we would see brain differences in these measures using a pre-post SNAP design, such as used in previously described EEG studies.

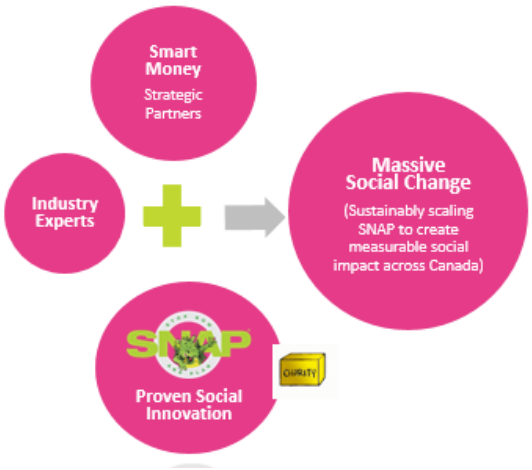
The SNAP research team at CDI is currently working on a number of studies, including a study led by researchers at the Centre of Addiction and Mental Health (CAMH) in Toronto (Kolla et al., in process). This project uses MRI to delineate if structural and functional brain changes accompanies the reduction in clinical scores in children taking part in SNAP, and if these differences are able to predict which children is most likely to benefit from SNAP. In addition, the SNAP research team conduct ongoing evaluation analysis and regular summaries that can be provided upon request (please contact Dr. Leena Augimeri).

Future Research Projects

An increasing amount of research is devoted to finding biological markers of disruptive and antisocial behaviour. The SNAP team recognizes that for the program to be as effective as possible, we need to understand the biology behind the behaviours that we see, and the damaging emotional and cognitive patterns that we aim to change. Thus, as SNAP continues to

gain momentum, collaborations with external research institutions that have the ability to measure neurobiological, endocrinological, and psychophysiological markers of treatment success will be implemented. Ongoing collaborations with leading research institutions such as the Hospital for Sick Children and CAMH in Toronto, as well as universities in the US and further afield, will be expanded and build upon to achieve this goal.

SNAP National Expansion



SNAP is currently engaged in a multi-year implementation strategy developed in 2013 (Phase 1 ending in 2022) when SNAP was selected by the LEAP|Pecaut Centre for Social Impact as their inaugural social innovation to scale across Canada. This strategy introduces a very unique model to Canada's children's mental health landscape - **Venture Philanthropy**, that brings together government, foundations, business, individual donors and community partners to scale up effective social innovations like SNAP to help create massive social change. It will enable SNAP to scale up from helping 700 children a year to approximately 7000 children a year across Canada. Currently SNAP is only reaching 5% of children with identified needs and the new strategy will increase the reach by 40%; potentially saving the Canadian society **over** $1 billion (e.g., mental health, health and criminal justice costs). This strategy includes the infusion of business skills and planning, in order to build capacity and fidelity, and sustainable growth across Canada (Augimeri et al., 2017).

As a result of this large scale national implementation, a SNAP implementation and data system (SNAP Implementation Tool; SNAPiT) was created for use by SNAP Headquarters at CDI and SNAP Affiliates to track SNAP operations, case management, outcomes and fidelity monitoring activities. This system will be instrumental in assisting external evaluators and the SNAP Implementation & Research Team with evaluation activities that will also contribute to the field of implementation science on scaling evidence-based programs like SNAP with high integrity and fidelity.

**Please see attached for SNAP references*

SNAP Designations: Samples

- **Washington State Institute for Public Policy** (WSIPP, 2019; www.wsipp.wa.gov/BenefitCost/ProgramPdf/615/Stop-Now-and-Plan-SNAP)
  - Designation: Evidence-Based
  - High Net Value in its category: Children's Mental Health (subcategory Disruptive Behaviour – 86%)
- **Crime Solutions** (www.crimesolutions.gov/ProgramDetails.aspx?ID=231)
  - Designation: Effective + (more than one study)
- **National Gang Center** (www.nationalgangcenter.gov/SPT/Programs/129)
  - Designation: Effective
- **Office of Juvenile Justice & Delinquency Prevention** (OJJDP: Model Program Guide; www.ojjdp.gov/mpg/Topic/Details/79)
  - Effective+ (linked to Crime Solutions)
- **Public Safety Canada**: Crime Prevention Inventory
  - www.publicsafety.gc.ca/cnt/cntrng-crm/crm-prvntn/nvntr/dtls-en.aspx?i=10149
  - www.publicsafety.gc.ca/cnt/cntrng-crm/crm-prvntn/nvntr/dtls-en.aspx?i=10054
- **Public Health Agency of Canada** (Canadian Best Practices Portal; www.cbpp-pcpe.phac-aspc.gc.ca/interventions/snap-stop-now-and-plan-model-programs)

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