**Supplementary material**

**Mplus SEAS Syntax**

To provide some instruction comments are provided after the !s on the syntax. For a Summary of the Mplus Language go to <https://www.statmodel.com/language.html>.

TITLE: SEAS BSEM

DATA: FILE IS = ; ! Location of the data file with saved syntax.

VARIABLE: ! Label names in the data file, in this instance survey items.

NAMES ARE SST31 SST32 SST33 SST34 SST35 SST36

ERT31 ERT32 ERT33 ERT34 ERT35 ERT36

AT31 AT32 AT33 AT34 AT35 AT36;

USEVARIABLES ARE SST31-AT36; ! Specify variables you want to use.

DEFINE:

STANDARDIZE SST31-AT36; ! For standardized estimates.

ANALYSIS:

ESTIMATOR = BAYES; ! Specify BAYES to run Bayesian estimation.

FBITERATION = 200000; ! Specify number of MCMC iterations.

CHAINS = 2; ! Specify number of MCMC chains.

PROCESSORS=2;

THIN = 10; ! Use every 10th iteration to reduce autocorrelation.

POINT=MEDIAN; ! Statistic used as the point estimate for the posterior distribution.

ALGORITHM = GIBBS(PX1); ! Specify the type of algorithm to use.

BSEED = 3; ! Specify random seed to start the MCMC chains.

MODEL: ! Specify hypothesized item-factor structure.

SS BY SST31-SST36;

ER BY ERT31-ERT36;

A BY AT31-AT36;

SS @1;

ER @1;

A @1;

! Specify cross loadings, text in brackets are parameter labels

SS BY ERT31-AT36\*0 (SS7-SS18);

ER BY SST31-SST36\*0 (ER1-ER6);

ER BY AT31-AT36\*0 (ER7-ER12);

A BY SST31-ERT36\*0 (A1-A12);

SST31-AT36 (RV1-RV18);

SST31-AT36 WITH SST31-AT36 (CR1-CR153);

MODEL PRIORS:

! Specify prior means and variances, adjust to check prior sensitivity of the model.

SS7-SS18 ~ N(0,.01);

ER1-ER12 ~ N(0,.01);

A1-A12 ~ N(0,.01);

RV1-RV18 ~ IW(1,24); ! specify number of correlated residuals.

CR1-CR153 ~IW(0,24);

OUTPUT:

TECH1 TECH8 STDYX; ! Will display potential scale reduction factor and standardized estimates.

PLOT:

TYPE = PLOT2; ! Provides posterior trace, histogram, and autocorrelation plots.

**Bayesian analysis**

We conducted a Bayesian structural equation model (BSEM) to further test the factor structure, model fit, and rigor of the SEAS. The limitations of applying a conventional confirmatory factor analysis (CFA) using maximum likelihood estimation to impose an independent cluster model (ICM) are well documented (see, Asparouhov & Muthén, 2010). BSEMs allows researchers to assess the factor validity of an identified model with fewer restrictions than ICM-CFA (Muthén & Asparouhov, 2012). Researchers can specify zero mean and small variance prior on cross-loadings and residual correlations within an identified model, resulting in more realistic parameter estimates (Lee & Song, 2004; see Muthén & Asparouhov, 2012, for a review). Thus, the following analysis aimed to substantiate the initial CFA SEAS validation study conducted by Barlow and colleagues (2013) by investigating the model fit of the SEAS under the Bayesian framework.

The following BSEM models were estimated in Mplus version 8.5 for each of the SEAS. The models included non-informative priors for major loadings and informative approximate zero cross-loading and exact zero residuals. The prior variances for cross-loadings and residual correlations were specified at N (0, 0.01). Indicators and factors were standardized representing factor loadings and residual correlations with a 95% limit of -.20 and +.20 (i.e., small cross-loadings and residual variances; Muthén & Asparouhov, 2012). For each model we reported the posterior predictive p-value (*PPP*) and potential scale reduction factor (PSRF) range as an estimate of the model fit (Gelman & Rubin, 1992; Muthén & Asparouhov, 2012). Following Asparouhov and Muthén’s (2015) recommendations we assessed the stability of the model by varying the variance of the priors, as this can influence parameter estimates. Subsequently, we re-analyzed each model with prior variances of .005 and .015 for cross-loadings and parameter estimates, comparing these estimated with those from a prior variance of .01. The follow BSEMs included all the participants who were recruited in their respective study (study 1, 2 and 3) regardless of their sporting activity. This allowed us to test the factor structure of the SEASs across a variety of sporting participants (such as those who engage in low-risk sport, high-risk sport, or both). Thus, the sample sizes in the following analysis (e.g., all participants regardless of sporting pursuits) do not match the sample sizes reported in the manuscript (e.g., participant who met the eligibility criteria for Studies 1, 2 and 3).

**Study 1 SEAS BSEM results**

We assessed each model using the same convergence and fit criteria (see, Muthén & Asparouhov, 2012, for recommendations). Each parameter trace plot displayed considerable overlap indicating that the parameters had converged on the posterior distribution. Additionally, autocorrelation was not considered large enough to warrant concern < 0.2 (Kruschke, 2013). We observed relatively smooth changes between adjacent frequency bars across all histograms suggesting that the posterior distributions were well represented (Depaoli & van de Schoot, 2017). With a sample of 663 participants each of the SEAS reported the following posterior predictive p-value (*PPP*) estimates with prior variances specified at N(0, 0.01): SEAS Time 1, *PPP* = 0.32; SEAS Time 2, *PPP* = 0.35; SEAS Time 3, *PPP* = 0.39. All *PPP* estimates above 0.05, and the potential scale reduction factor (PSRF) estimates between 1.0 and 1.1, indicated adequate Markov chain Monte Carlo (MCMC) chain convergence and a well-fitting model (Gelman & Rubin, 1992).

Significant standardized major loading suggested that items loaded well onto their intended factors (SS 0.53 – 0.91, ER 0.59 – 0.95, A 0.62 – 0.95), with trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.3). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). Altering our prior variances from .01 to .005 and .015 did not result in a meaningful change in the convergence, parameter estimates, and fit of the models, indicating low prior variance sensitivity and a robust fitting model (Muthén & Asparouhov, 2012).

**Study 2 SEAS BSEM results**

Each model was assessed using the same convergence and fit criteria from Study 1. With a sample of 291 participants none of the models raised any diagnostic concerns (PSRF 1.0 – 1.1) reporting the following *PPP* estimates: SEAS Time 1, *PPP* = 0.35; Time 2, *PPP* = 0.40; Time 3*, PPP* = 0.45. Significant standardized major loading suggested that items loaded well onto their intended factors (0.5 – 0.9) reporting trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.34). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). These results indicate that the models performed well under the three-factor hypothesized model of the SEAS.

**Study 3 SEAS BSEM results**

Each model was assessed using the same convergence and fit criteria applied in Study 1. With a sample of 161 participants none of the models raised any diagnostic concerns (PSRF 1.0 – 1.1) reporting the following *PPP* estimates: SEAS Time 1, *PPP* = 0.34; Time 2, *PPP* = 0.43; Time 3*, PPP* = 0.46. Significant standardized major loading suggested that items loaded well onto their intended factors (0.3 – 0.9) reporting trivial small cross-loading (< 0.2). Inter-factor correlations revealed weak relationships between agency and sensation seeking (<. 0.3) and emotion regulation and sensation seeking (< 0.3). Agency and emotion regulation revealed strong correlations across all three BSEM models (> 0.6). These results suggest that the models again performed well under the SEAS three-factor hypothesized model.

**Measurement discussion**

After nine separate BSEM assessments, the hypothesized three-factor model of the Sensation Seeking Emotion Regulation and Agency scale (SEAS) fitted well across retrospective and prospective research designs. These results provide further support for the reliability and validity of the SEAS as a measure of individuals sensation seeking, emotion regulation and agency motives.