Predicting internalizing symptoms over a two year period by BIS, FFFS and attentional control

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ABSTRACT

Identifying risk factors for the development of internalizing disorders is of major importance. In this context, behavioral inhibition (BIS), the fight-flight-freeze-system (FFFS), and attentional control (AC) have been proposed as being possible risk factors for both anxiety disorders and depression. Even though related cross-sectionally, it is still unclear whether these factors are precursors for internalizing disorders. In this longitudinal study, 1811 participants (aged 12–15) completed questionnaires on BIS/FFFS, AC, and internalizing symptoms at pretest and at two year follow-up. Supporting the alleged importance of BIS/FFFS and AC in the development of internalizing symptoms, BIS/FFFS and AC showed predictive value for anxiety and depression symptoms at two year follow-up. For anxiety symptoms this predictive value was not independent of the level of symptoms at pretest. For depression symptoms, AC showed predictive value over and above pretest level of depression symptoms. In the context of early detection of at risk adolescents, results suggest that screening of current anxiety and depression symptoms is most relevant in addition to a focus on AC for the screening of depression. However, it cannot be ruled out that at a further extended follow-up also BIS/FFFS might show independent predictive value for symptoms of anxiety and/or depression.

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1. Introduction

There is growing evidence that temperamental factors are involved in the development of internalizing disorders (e.g. Muris & Ollendick, 2005). Among these temperamental factors behavioral inhibition (BIS), fight-flight-freeze-system (FFFS), and attentional control (AC) appear to be important (e.g. Johnson, Turner, & Iwata, 2003). The concepts of BIS and FFFS have been conceptualized in the reinforcement sensitivity theory (RST) by Gray (1982), and later on revised by Gray and McNaughton (2000). According to the RST, FFFS gives rise to feelings of fear together with responses aimed at reaching safety. BIS is considered as a goal-directed system, which is activated upon conflict within FFFS or BAS or between FFFS and BAS. FFFS is hypothesized to be specifically involved in panic disorder and social phobia, whereas BIS would underlie all anxiety disorders and depression (e.g. Corr, 2008). Since empirical research so far has primarily focused on BIS rather than making the distinction between BIS and FFFS, most previous evidence concerning BIS might also cover FFFS.

The positive relationship between symptoms of internalizing disorders and BIS has been established cross-sectionally for various kinds of anxiety related disorders (e.g. Corr, 2008). The cross-sectional relationship between depression symptoms and BIS is also well-established, with several studies reporting a link between depression and BIS (e.g. Johnson et al., 2003).

AC is the ability to focus and switch attention, and might also be involved in the etiology and maintenance of internalizing disorders (Rothbart, Ellis, & Posner, 2004). It can be seen as part of regulatory temperament: high AC would provide a person with the ability to inhibit a dominant response (Rothbart & Bates, 1998). Accordingly, adolescents low in AC might be vulnerable for internalizing disorders because they are less able to direct attention away from anxiety and/or depression provoking stimuli (switching), and are at the same time less able to focus their attention on the task at hand (focusing) (Sportel, Nauta, de Hullu, de Jong, & Hartman, 2011).

Previous cross-sectional research showed a robust negative relation between AC and symptoms of social anxiety, generalized anxiety, separation anxiety, obsessive–compulsive disorder, panic disorder, and depression (Muris, 2006; Muris, van der Pennen, Sigmond, & Mayer, 2008; Vervoort et al., 2011). In anxiety disorders the link with BIS is stronger than with AC, whereas for depression symptoms AC holds a stronger link compared to BIS (Sportel et al., 2011).

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Besides the relationship between AC and BIS on the one hand and internalizing disorders on the other, there is evidence that a combination of high BIS and low AC is associated with the highest levels of anxiety (e.g. Sportel et al., 2011). These findings suggest that especially adolescents with both high BIS and low AC are at risk for developing an anxiety disorder. A combination of high BIS and low AC has also been found to be related to symptoms of depression (Sportel et al., 2011). How FFFS would fit into this picture has not yet been the focus of empirical research. Since FFFS is assumed to be specifically related to social phobia and panic disorder, we expect highest levels of social anxiety and panic symptoms in adolescents with combined high FFFS and low AC.

The studies mentioned above employed a cross-sectional design, and thus no conclusions can be drawn regarding the direction of the reported relationships. In an attempt to test further the alleged role of temperamental factors in the development of internalizing symptoms, van Oort, Greaves-Lord, Ormel, Verhulst, and Huizink (2011) used a longitudinal approach, and showed a predictive relationship between low effortful control (an overarching concept containing AC, activation control, and inhibitory control) and heightened future levels of anxiety in adolescents.

The current study was designed to replicate and extend this important finding. Following a similar longitudinal approach we tested whether in addition to AC also the separated systems BIS and FFFS have independent predictive validity for future symptoms of internalizing disorders. This approach also allowed us to test whether especially the combination of low AC and high BIS or FFFS might be involved in the development of internalizing disorders. Moreover, we not only tested the prognostic value of BIS, FFFS, and AC for the development of anxiety symptoms but also for the development of depression symptoms. This study focussed on early adolescents, since the onset of anxiety and depression symptoms is associated with this age group (Kessler et al., 2005). Following from the above, we hypothesized that high BIS, high FFFS (for social anxiety and panic disorder), and low AC at pretest would be predictive of higher internalizing symptoms at follow-up. In addition, we expected that individuals with a combination of high BIS and/or FFFS with low AC would be especially at risk for developing internalizing complaints.

Previous research showed that the initial level of internalizing symptoms is also strongly associated with future levels of internalizing symptoms. This has been shown for depression and anxiety over a 2-year period in adolescents aged 12–17 (O'Connor, Rasmussen, & Hawton, 2010; Sears & Armstrong, 1998), and for the period of preadolescence until 16, and from 16 up to 17.5 years (Bosquet & Egeland, 2006). However, these studies did not include temperamental factors. It remains therefore unclear whether temperamental factors have prognostic value over and above the level of baseline symptoms. Since the present study included both baseline measures of internalizing symptoms and measures of AC, BIS, FFFS, the present design allowed to test to what extent the alleged predictive value of temperamental factors is independent of the level of baseline symptoms.

2. Methods

2.1. Participants and procedure

As part of an early intervention study, a large group of adolescents (816 boys; 995 girls, mean age 13.7 years, SD = .71) in the first or second year of 25 secondary schools in the northern part of the Netherlands were screened with the main goal of detecting adolescents with 'at risk' levels of anxiety. As part of the procedure, all participants were invited for a follow-up of the screening two years later. At two year follow-up 1161 participants completed

the assessment (534 boys and 627 girls, mean age 15.6 years, SD = .71). Participants were tested group wise at school. Questionnaires were completed on a laptop computer in the presence of a research assistant. At item level there are no missing data since the assessment took place on computers. At participant level, there was 35.9% missing data at the two year follow-up. The study was approved by the medical ethics committee of the University Medical Center Groningen.

2.2. Questionnaires

2.2.1. Symptoms of DSM-IV based anxiety and depression

The Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a 47-item self-report questionnaire, with items rated on a 4-point scale (0–3). It consists of six scales: separation anxiety disorder (SAD), social phobia (SP), obsessive–compulsive disorder (OCD), panic disorder (PD), generalized anxiety disorder (GAD) and major depressive disorder (MDD). There is an overall scale indicating the total level of internalizing psychopathology. In this sample the Cronbach's alphas at pretest were as follows: total (α = .95), GAD (α = .84), SP (α = .86), SAD (α = .71), PD (α = .80), OCD (α = .72), and MDD (α = .80).

2.2.2. Behavioral inhibition/Fight-Flight-Freeze-System

The Behavioral Inhibition/Behavioral Activation System Scales (BIS; Carver & White, 1994) is a 20-item self-report measure, with items rated on a 4-point scale (1–4). We used the BIS/FFFS-scales in the current study. The psychometric properties of this questionnaire showed sufficient internal consistency for all subscales (Carver & White, 1994). The BIS-scale showed a satisfactory internal consistency at pretest (α = .71), the FFFS-scale showed an internal consistency at pretest of (α = .45). Due to this low internal consistency the results of the FFFS-scale should be interpreted with care.

2.2.3. Attentional control

The Adult Temperament Questionnaire (ATQ; Rothbart, Ahadi, & Evans, 2000) is a 77-item questionnaire, with items rated on a 7-point scale (1–7). For the purpose of the current study, the subscale Attentional Control (AC) of the scale Effortful Control was used, which measures the ability to focus and switch attention. In the current study the AC subscale had satisfactory internal consistency (α = .71).

2.3. Missing data

Not all participants who completed the pretest (N = 1811) also completed the follow-up assessment (n = 1161). Possible reasons for this drop out were: (1) went to another school, (2) did no longer want to participate, or (3) did not show up during the assessments. To optimally deal with the missing data we used multiple imputation (Jelicić, Phelps, & Lerner, 2010). Missing data was imputed 40 times using PASW Statistics18.0, based on all available data from pretest and RCADS subscales from two year follow-up. Multiple imputation renders pooled results over all performed imputations. All analyses were performed on the original data as well, which yielded similar, although somewhat larger effects.

2.4. Statistical analyses

We used hierarchical regression analyses to predict anxiety and depression from BIS, FFFS, AC, and their interactions. All outcome variables were measured at two year follow-up, while the predictor variables were measured at pretest. The hierarchical regression analyses were done separately for: total RCADS symptoms, generalized anxiety disorder, social phobia, separation