Birth cohort increases in psychopathology among young Americans, 1938–2007: A cross-temporal meta-analysis of the MMPI ☆

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ABSTRACT

Two cross-temporal meta-analyses find large generational increases in psychopathology among American college students ($N = 63{,}706$) between 1938 and 2007 on the MMPI and MMPI-2 and high school students ($N = 13{,}870$) between 1951 and 2002 on the MMPI-A. The current generation of young people scores about a standard deviation higher (average $d = 1.05$) on the clinical scales, including Pd (Psychopathic Deviation), Pa (Paranoia), Ma (Hypomania), and D (Depression). Five times as many now score above common cutoffs for psychopathology, including up to 40% on Ma. The birth cohort effects are still large and significant after controlling for the L and K validity scales, suggesting that the changes are not caused by response bias. The results best fit a model citing cultural shifts toward extrinsic goals, such as materialism and status and away from intrinsic goals, such as community, meaning in life, and affiliation.

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Contents

1. Introduction

Are today's Americans more likely to suffer from psychopathological symptoms than their counterparts were a few decades ago? Many studies have found that recent generations are more likely to meet the criteria for major depressive disorder (MDD; Lewinsohn, Rohde, Seeley & Fischer, 1993; Robins et al., 1984; Wickramaratne, Weissman, Leaf, & Holford, 1989; for a review, Klerman & Weissman, 1989). Some of these studies reported very large changes, with only 1–2% of people born early in the 20th century reporting experience with MDD, compared to more than 15–20% of those born after the middle of the century.

However, these studies relied on retrospective accounts — participants' memories of past depressive episodes — to estimate the lifetime prevalence of depression among different birth cohorts. Thus, the apparent birth cohort effect could be due to older people forgetting past depressive episodes or minimizing them with the passage of time (Klerman & Weissman, 1989). Memories of past depressive episodes could also be biased. Patten (2003) found that recall bias explains at least some of the cohort effect in depression in cross-sectional studies, as people are especially likely to forget incidents of depression experienced during adolescence.

Selective mortality could also confound the results: because depressed people do not live as long as others (e.g., Murphy, Monson, Olivier, Sobol, & Leighton, 1987), there will be fewer depressed people in a sample of older people than in a sample of younger people. This would falsely appear as a birth cohort increase in depression. These limitations occur because previous studies have been cross-sectional, examining people of different ages at only one time. Whether examining past or current symptoms, any differences in a cross-sectional study could be due to either age or to birth cohort, and it is impossible to tell which is driving the effect (Lewinsohn et al., 1993; Schaie, 1965).

The present analysis examined real-time reports of psychiatric symptoms from data collected at different times. Specifically, we analyzed how Minnesota Multiphasic Personality Inventory (MMPI) scores changed between the 1930s and the present among high school and college students, providing a comprehensive picture of generational changes in mental health. This time-lag design identifies generational (or birth cohort) differences without the confound of age or the problem of retrospective accounts. We also review the previous literature on change over the generations in psychopathology.

1.1. Social changes

Why might psychopathology have changed? Although a historical analysis cannot prove causation, it can show which aspects of the sociocultural environment co-occur with shifts in reported psychopathology. At base, generational changes demonstrate the effect of culture on the individual. The logic underlying this approach is similar to that used to assess the traits and behaviors of individuals across different world regions (e.g., Kim & Sherman, 2007; Heine & Lehman, 1997; Markus & Kitayama, 1991); different eras have markedly different cultures just as different regions do. For example, children growing up in the 1950s were exposed to a fundamentally different culture than children growing up in the 1980s. Several previous studies have found strong birth cohort differences in characteristics such as anxiety, extraversion, locus of control, sexual behavior, and future expectations (e.g., Reynolds, Stewart, MacDonald, & Sischo, 2006; Scollon & Diener, 2006; Twenge, 2000; Twenge, Zhang, & Im, 2004; Wells & Twenge, 2005; for a review, Twenge, 2006). Some of these studies also found that social indicators, such as the crime rate, divorce rate, and unemployment rate, correlated with generational trends. For changes in the MMPI, we focus on three models that might best explain changes in psychopathology across the generations.

1.1.1. The extrinsic vs. intrinsic goals model

Although many factors may influence generational changes in anxiety and depression, much theorizing has focused on the role of materialism, individualism, unrealistic expectations, and unstable relationships (e.g., Eckersley & Dear, 2002; Myers, 2000; Seligman, 1990). These authors argue that consumer culture and individualism have raised the bar of expectations so high that mental health suffers as a result. This view draws support from research finding that people pursuing extrinsic goals such as money, looks, and status are more likely to be anxious and depressed (Kasser & Ryan, 1996). A focus on extrinsic goals undermines the satisfaction of the important intrinsic goals of competence, affiliation, and autonomy and leads to poor relationships and antisocial behavior (Deci & Ryan, 2000; Kasser, 2003).

Most evidence suggests that young Americans' focus on extrinsic goals is increasing. Surveys of high school and entering college students have shown a marked increase in materialistic values between the 1970s and the present, with more high school students agreeing that "having a lot of money" is important and more college students agreeing it is important to "be well-off financially" (Pryor et al., 2007; Twenge & Campbell, 2010). Narcissism, which is correlated with extrinsic goals (e.g., Kasser & Ryan, 1996), has also increased (Roberts & Helson, 1997; Twenge & Foster, 2008, in press; Twenge, Konrath, Foster, Campbell, & Bushman, 2008). Young people also express significantly higher expectations for jobs and educational attainment, expectations some have labeled unrealistic as they are far higher than likely outcomes (Reynolds et al., 2006; Twenge & Campbell, 2008).

Just as extrinsic goals have increased, intrinsic goals have waned. Involvement in community groups rose between the 1930s and the early 1960s and then declined precipitously (Putnam, 2000), and high school students are now less likely to say they are interested in government affairs (Twenge & Campbell, 2010). Fewer Americans said they had close friends in whom they could confide in 2004 compared to 1985 (McPherson, Smith-Lovin, & Brashears, 2006), the divorce rate doubled between the 1930s and the 1970s (though it has declined slightly since the 1980s), and more people now live alone (U.S. Bureau of the Census, 2008). Even when these factors do not directly impact an individual (e.g., one's parents getting divorced), they are general indicators of the state of close relationships in a society — and thus, an indicator of the culture's general attitude toward intrinsic goals such as affiliation. The intrinsic goal of meaning has also declined, with fewer college students agreeing that it is important to "develop a meaningful philosophy of life" (Pryor et al., 2007). With extrinsic goals more

important and intrinsic goals less important in American society, this model predicts a higher rate of psychopathology over time, especially after the mid-1960s.

1.1.2. The economic cycles model

Poor mental health may also be linked to increased economic woes. Threats leading to anxiety can be physical or psychological (Barlow, 1988; May, 1979; Spielberger & Rickman, 1990), and anxiety and depression are associated with loss (Rholes, Riskind, & Neville, 1985), a frequent outcome of bad economic times (e.g., job loss, home foreclosure, and, as a sequelae, relationship troubles). Some authors have suggested that economic hardship is the modern equivalent of physical (and sometimes emotional) threat (Barlow, 1988). In the modern world, economic difficulties are detrimental to optimal survival and reproduction and thus, produce anxiety. Crime also increases during economic downturns, which can also lead to anxiety.

If economic woes are linked to psychopathology, MMPI scores should rise and fall along with the economic depressions and recessions of the last 7 decades. Scores would thus, follow a curvilinear rather than a linear pattern. Unemployment, a proxy for the economy linked to psychopathology and depression (e.g., Burgard, Brand, & House, 2007) was very high in the 1930s, low during the 1940s through most of the 1960s, high during the frequent recessions of the 1970s and 1980s, and low during most of the 1990s and 2000s. Thus, the economic cycles model predicts high MMPI scores on the clinical scales in the Depression-era late 1930s, low scores during WWII and the 1950s and 1960s, high scores during the 1970s through the early 1990s, and lower scores during the good economic times of the mid-1990s to the mid-2000s. However, economic cycles may not have such a direct or lasting effect on psychopathology. Depressive symptoms related to unemployment are often temporary, fading when a new job is found. In addition, it is possible that growing up during good economic times may actually lead to later depression if the economy shifts toward the worse and expectations are violated.

The high school and college students in this study might be seen as relatively isolated from economic cycles. However, young people are affected by economic changes through their parents. Young people whose parents are unemployed have lowered psychological well-being, mostly because economic problems strain parent–child interactions (Isralowitz & Singer, 1986; McLoyd, Jayaratne, Ceballo, & Borquez, 1994). In bad economic times college students may also anticipate having trouble finding a job once they graduate and/or have trouble finding a part-time job to help pay tuition and living expenses. We tested predictions from the economic cycles model in all analyses by investigating curvilinear patterns over the generations on each of the MMPI scales.

1.1.3. The response bias model

Changes in socially desirable responding must also be considered. Mental illness is less stigmatized today than it was in the 1940s and 1950s. Swindle, Heller, Pescosolido, and Kikuzawa (2000) favored the response bias explanation for their results finding a rise in nervous breakdowns between the 1950s and the 1990s. A previous study found that scores on the Marlowe–Crowne Social Desirability Scale decreased between the late 1950s and late 1970s, and then stayed fairly steady at this low level 1980s–2000s (Twenge & Im, 2007). This suggests that young people have become less concerned with social approval and thus, less inclined to display a social desirability response set. Thus, any change in the MMPI clinical scales could be due to a greater willingness to admit to mental problems, at least until the late 1970s.

The response bias model makes two predictions. First, means on the MMPI scales designed to measure defensive or socially desirable responding should decrease over the generations, particularly 1938–1980. The Lie (L) scale measures the tendency for participants to present themselves as highly virtuous. The correction (K) scale assesses how much participants defensively seek to obscure any psychopathological symptoms they might possess. According to the response bias model, scores on the L and K scales should decrease over the generations. Second, controlling for L and K will eliminate or greatly reduce any changes in psychopathology on the clinical scales.

1.2. Previous research

A few other studies have examined birth cohort changes in MMPI scores. Newsom, Archer, Trumbetta, and Gottesman (2003) compared high school students' responses to the MMPI in samples collected in 1948–1954, 1985, and 1989 and showed significant increases on all of the clinical scales over this time period. It is possible these differences were due to region, as the 1948–1954 samples were collected in Minnesota and the 1985 and 1989 samples from several regions. Changes since 1989, the latest data available at the time, are also unknown. Colligan, Osborne, Swenson, and Offord (1984) collected a 1983 sample with demographics similar to the original 1930s MMPI normative sample and found higher mean scores. These differences were most pronounced for the younger people, as would be expected for a birth cohort change. At least one study examined changes in college students' MMPI scores in an earlier era: Schubert and Wagner (1975) found increases on some MMPI scales between 1958 and 1969 among students at one campus, a result they attributed to "the glamorization of alienation." Thus, there is at least some empirical precedence for the extrinsic vs. intrinsic goals model's prediction of a linear increase in psychological symptoms on all MMPI clinical scales over generations.

Other studies of birth cohort changes in depression and psychopathology have produced mixed results, with some finding increases and others reporting null results. Twice as many people reported experiencing panic attacks in 1995 than in 1980 (Goodwin, 2003), and twice as many people reported feeling that they were about to experience a nervous breakdown in 1996 compared to 1957 (Swindle et al., 2000). Scores on four anxiety and neuroticism scales increased between 1952 and 1993 among both college students and children (Twenge, 2000), and neuroticism showed cohort increases in a longitudinal study of adult Australians (Scollon & Diener, 2006). Collishaw, Maughan, Goodman, and Pickles (2004) found that almost twice as many parents in the United Kingdom reported that their teenage children experienced emotional and conduct problems in 1999 than had in 1974. A similar result emerged for both self- and parent-reported mental health problems for British teen girls from 1986 to 2006, and for boys in parent-reported problems, with twice as many reporting frequent feelings of depression or anxiety in 2006 (Collishaw, Maughan, Natarajan, & Pickles, 2009). Achenbach, Dumenci, and Rescorla (2003) found that psychological problems captured by the Children's Behavior Checklist increased in the U.S. from 1976 to 1989 but declined between 1989 and 1999. Benton, Robertson, Tseng, Newton, and Benton (2003) found that twice as many students were seen for depression and three times as many for suicidal ideation between 1989 and 2001 at the Kansas State University counseling center.

However, other studies have not found significant changes in psychopathology over the generations. Costello, Erkanli, and Angold (2006) meta-analyzed 26 studies and found no evidence of an increase in the rate of depression among children and adolescents across 30 years, a finding they attributed to the difference between the concurrent reports used in their study and the retrospective accounts used in much previous research. McArdle, Prosser, Dickinson, and Kolvin (2003) examined children in an industrial city in England in 1973 and 1994 and also found no changes in the mental health of children based on birth cohort. Twenge and Nolen-Hoeksema (2002) found no changes in depressive symptoms among girls and slight decreases for boys between the late 1970s and the late 1990s. Thus, although there is a fair consensus on increases in some problems (such as anxiety), there is conflicting evidence on whether there has been an increase in depressive symptoms or a decline in

general mental health among young people. The current meta-analysis offers the most complete set of MMPI data over the generations, which provides ample statistical power to detect changes in MMPI scores over time, thereby enabling us to resolve seemingly conflicting findings.

1.3. The validity of the MMPI scales

Between the 1940s and the 1980s, the MMPI was the most popular and widely used psychological inventory (Lupin, Larsen, & Matarazzo, 1984). It continues to be used widely today, especially in mental health, forensic, correctional, and job profiling situations (e.g., Archer, 2006). Thousands of studies have examined the validity of the MMPI in predicting and describing psychopathic symptoms, job performance, and countless behaviors and profiles (Graham, 2006; Butcher, 2006). In addition, MMPI clinical scales are highly correlated with more recent measures of the same traits. For example, the MMPI D (Depression) scale correlates very highly with the Beck Depression Inventory (Carter & Dacey, 1996; Lubin & Van Whitlock, 1995), and its clinical scales are highly correlated with more recent anxiety measures such as the State-Trait Anxiety Inventory (Novy, Nelson, & Goodwin, 1993). The MMPI Pd scale, a measure of antisocial behavior and defiance, correlates with a more recent measure of nonconformity (Gynther, Burkhart, & Hovanitz, 1979). Thus, a large body of evidence attests to the validity and reliability of the MMPI as a measure of psychopathology.

1.4. Data analysis plan

We employ cross-temporal meta-analysis (Twenge, 2000), which relies on mean scores rather than effect sizes as does a traditional meta-analysis. We examined the most commonly used MMPI scales, including the validity scales L (Lie), K, and F (infrequency, a measure of unusual responses) and the eight clinical scales of psychopathology, including Scale 1, Hy (Hypochondriasis); Scale 2, D (Depression), Scale 3, Hs (Hysteria); Scale 4, Pd (Psychopathic Deviation); Scale 6, Pa (Paranoia); Scale 7, Pt (Psychasthenia); Scale 8, Sc (Schizophrenia); Scale 9, Ma (Hypomania). We also examined the two non-clinical scales, Scale 5 Mf (Masculinity/Femininity) and Scale 0, Si (Social Introversion). Analyses of college students include samples completing the MMPI and MMPI-2 (as detailed below, we converted MMPI-2 scores to the original MMPI T-scores; the two measures vary by only a few questions, with some other questions updated with more modern language; Graham, 2006). We also analyzed the data separately for samples completing the MMPI vs. the MMPI-2. Analyses for high school students rely on the MMPI-A.

We examined changes in both means and standard deviations. If means have changed and standard deviations have not, that suggests that more recent generations display more (or less) psychopathology on average. If both means and standard deviations have changed, that would also mean more psychopathology, but would suggest larger changes at one extreme of the distribution.

We performed several analyses to address the fit of the three theoretical models. A linear pattern of change is more consistent with the extrinsic vs. intrinsic goals model or the response bias model, and a curvilinear pattern is more consistent with an economic cycles model. To further test the extrinsic vs. intrinsic goals model, we examined the correlation between the MMPI clinical scales and a measure of extrinsic goals from the American Freshman survey (the percentage of college students agreeing that "becoming well-off financially" is an important goal; Pryor et al., 2007). This survey has been conducted every year since 1966 (Thus, it covers only the later part of the time period here). Another question on the survey asks whether "developing a meaningful philosophy of life" is important; this is an indicator of the intrinsic goal of finding meaning. We also examined the correlation with the divorce rate, an inverse measure of

the intrinsic goal of affiliation that is available for the entire time period. Although high school and college students are mostly unmarried themselves, the divorce rate describes features of their family life and may influence their perception of the anticipated stability of their own adult relationships.

To test the economic cycles model, we examined the correlation between the MMPI scales and the unemployment rate for each year. To test the response set model, we analyzed the clinical scales with controls for L and K. This allowed a view of psychopathology independent of trends in the response biases captured by these scales.

Our analysis centers on high school and college students. In a time-lag analysis, it is important that means are reported for participants in a restricted age range. Samples of adults were often either a) too diverse in age, or b) restricted to specific professions (e.g., police officers). We limited the analysis to United States samples because there were too few samples from other countries to examine cultural change within other cultures.

2. Method

2.1. Literature search

Studies were located using PsycInfo (for journal articles) and Dissertation Abstracts (for unpublished dissertations and master's theses) using the keywords "Minnesota Multiphasic Personality Inventory" and "MMPI." Dissertations not available through Interlibrary Loan were examined at the Library of Congress in Washington, DC.

2.2. Inclusion rules

To be included in the analysis, a study had to meet the following criteria: a) participants were high school students or college under-graduates at conventional four-year institutions (e.g., not two-year colleges, not military academies); b) participants were attending high school or college in the United States; c) means were reported for unselected groups of students, not those chosen for scoring high or low on a measure or singled out for being maladjusted, clients at a counseling center, children of alcoholics, etc., d) the sample had at least 10 participants (in the final dataset, sample sizes ranged from 16 to 3282), and e) means were reported for the sample on the MMPI-A (for high school students) or the MMPI or MMPI-2 (for college students). Year of data collection was coded as two years prior to publication unless another date was mentioned in the article (Oliver & Hyde, 1993). Most college participants were from introductory psychology courses, though some were from other classes or other campus sources. The samples were collected from all regions in the U.S. at both private and public institutions. As region was a possible confound in previous studies, we also performed analyses controlling for region of the U.S. (East, Midwest, South, and West according to the U.S. Census designations of states.).

For the high school samples, we restricted our analysis to samples that either completed the MMPI-A or completed the MMPI but reported means using the MMPI-A norms. Although some other researchers reported adolescent data on the MMPI, the norms used to report these scores are not comparable to the MMPI-A norms. We examined adolescents' responses before 1989 using two datasets reported in Newsom et al. (2003) renormed on the 1989 MMPI-A norms, one from 1985 and another from 1948–1954.

2.3. 2007 sample

To supplement the limited recent college student data on the MMPI, we collected samples of 222 undergraduates (164 females) at the University of Kentucky and 222 undergraduates (192 females) at San Diego State University who completed the original MMPI online in fall 2007 in partial fulfillment of their introductory psychology

research requirement. There were few differences between campuses on the scales, so we combined them into one sample for analysis.

2.4. Total sample

The meta-analysis search and the 2007 data collection resulted in 117 samples of 63,706 college students on the MMPI and MMPI-2 between 1938 and 2007 and 14 samples of 13,870 high school students on the MMPI-A between 1951 and 2002.

2.5. Changes in college populations

A study of college student samples over time must address the issue of changing college populations. We addressed this issue in a number of ways. First, we confirmed changes in psychopathology in samples of high school students who completed the MMPI-A. These samples are less likely to have selection bias over time and are more diverse in socioeconomic status and race/ethnicity than college student samples. Second, we relied on evidence from past research. Previous cross-temporal meta-analyses have found similar results in child and college samples (Twenge, 2000; Twenge & Im, 2007; Twenge, Zhang, & Im, 2004), suggesting that birth cohort effects are not caused by changes in college populations.

Third, we examined key variables for change over time among college populations. Socioeconomic status has not changed, at least for the time period when data are available: When adjusted for inflation, the median income of college students' parents did not vary by more than $3000 between 1966 and 2004 (Pryor et al., 2007; U.S. Bureau of the Census, 2008). The racial composition of college student samples has differed only slightly over this time period. Black students earned 4% of bachelor's degrees in 1940 and now earn about 9%; Asians increased from 3% in 1980 to 7% now, and Hispanics increased from 3% in 1980 to 7% now. Although these represent significant improvements for these specific racial groups, these shifts do not dramatically change the racial makeup of college samples, which are still overwhelmingly white. The largest change in student demographics over this time occurred for women, who were 41% of college graduates in 1940 and 57% in 2005. We will control for this possible confound by examining the data separately by gender.

The number of high school graduates who enroll in college has changed, though the shifts are largest from the 1940s to the 1960s and are not linear. Before 1960, statistics on the college enrollment of high school graduates are not available. One proxy is the number enrolled in college in a given year divided by the number enrolled in high school in the same year. In 1940, college enrollment was 21% of high school enrollment; this rose to 41% in 1950. In 1960, 45% of high school graduates enrolled in college; this rose to 55% in 1968. College enrollment then declined during the 1970s (it was 52% in 1970 and 49% in 1980), not reaching the 1968 figure of 55% again until 1984. Enrollment increased steadily from the late 1980s (58% in 1985) to 1997 (67%) and then declined (62% in 2001). It then rose again; in 2005, 69% of high school graduates enrolled in college (all statistics from U.S. Bureau of the Census, 2008 and earlier issues). Of course, these statistics are relevant to this study only if higher enrollment causes accompanying shifts in MMPI scores. To our knowledge, there is no evidence showing that high school graduates who now enroll in college who would not in an earlier era differ in psychiatric symptoms from the previous norm. In addition, four-year colleges and universities have become more selective in their admissions standards, with most now accepting a smaller percentage of their applicant pool than in the past (Twenge, 2006). This could lead to less psychopathology in college samples over time; for example, when a health sciences program in Ohio tightened its admissions standards, scores on an anxiety measure declined (Borges, Manuel, Elam, & Jones, 2006). Thus, it is not clear whether changes in college enrollment will have any effect on MMPI scores.

2.6. Data analytic strategy

We relied on T-scores (with the standard K-corrections for the appropriate scales) in our analyses, as this is the most common way to report MMPI scores. Although there is debate surrounding the K-correction, only 13% of studies in our analysis reported means without K-corrections on the 5 scales where it is usually applied (Hs, Pd, Pt, Sc, and Ma). Thus, we were not able to analyze non-K-corrected means on these scales. Raw scores were converted to T-scores using the original T-score metric based on the original MMPI normative data. In addition, we converted MMPI-2 raw and T-scores to the original MMPI T-scores to allow for comparison across the entire time period. Thus, the T-scores are all based on the original MMPI means. Although the MMPI-2 reworded some items and omitted a few others, the two scales are extremely similar (Graham, 2006). We also report analyses within each inventory (MMPI only and MMPI-2 only).

As in previous cross-temporal meta-analyses, means were weighted by the sample size of each study to provide better estimates of the population mean. We performed our analyses using SPSS. We report both standardized βs (the weighted correlation between scores and year) and unstandardized Bs (the amount the scores change) converted into an effect size estimate using the variance among individuals. Because the standardized βs rely on the variance among means, we use the number of studies (rather than the number of individuals) as the df for computing significance. These βs are ecological or alerting correlations (Rosenthal, Rosnow, & Rubin, 2000), which are most relevant for understanding changes at the group level rather than the individual level. They are by nature larger as there is less variance among means than among individuals.

Thus, to compute an effect size (d) — the magnitude of the change relevant to a population of individuals — we multiplied the unstandardized Bs by the number of years and divided by the average standard deviation (SD) of the individual samples obtained from the data sources (reflecting the average variance of the measure in a sample of *individuals*). This yields an effect size (d) that reflects the amount of variance explained by cohort among individuals, and avoids the issue of ecological correlations. In summary, the correlations and standardized βs reported here reflect variance among groups, but the effect sizes (d's) reflect variance for individuals.

3. Results

3.1. College students

3.1.1. Change over time

Consistent with the extrinsic vs. intrinsic goals model, the MMPI clinical scale scores of American college students rose steadily between 1938 and 2007 (see Tables 1 and 2 and Figs. 1–4). Compared to college students in the 1930s and 1940s, recent U.S. college students score more than a standard deviation higher on the F scale (a measure of unusual responses), Psychopathic Deviation, Paranoia, Schizophrenia, and Hypomania, more than three-fourths of an SD higher on Hypochondrasis, Depression, Psychasthenia, and .45 SDs higher on Hysteria. For the clinical scales and the F scale, the average change over time is 1.05 SDs; thus, birth cohort explains about 20% of the variance in MMPI scores. Assuming a normal distribution, 85% of recent college students score above the 1930s–1940s average on measures of psychopathology. Using the 1930s–1940s college student means as a benchmark, 70% more college students now score above average on these measures of psychopathology (85 out of 100 now, vs. 50 out of 100 then; 35/50 = 70%). On the F and Ma scales, 94% of recent college students score above the original mean.

Changes in the clinical scales are linear and not curvilinear over time (see Figs. 1–4), supporting the extrinsic vs. intrinsic goals model rather than the economic cycles model. Analyses including the centered quadratic and cubed term for year showed non-significant

Table 1
Standardized betas between MMPI scores and year among college students, weighted by sample size.

	MMPI and MMPI-2, all	All, controls for L and K	Males only	Females only	MMPI only	MMPI-2 only (1989–2005)
L	−.18 (93)	–	−.06 (75)	−.32** (67)	−.04 (53)	.33* (40)
F	.81*** (87)	.60*** (85)	.84*** (73)	.77*** (64)	.80*** (51)	.25 (36)
K	−.56*** (103)	–	−.42*** (87)	−.65*** (77)	−.48*** (62)	.23 (41)
Hs	.71*** (106)	.76*** (83)	.63*** (92)	.77*** (90)	.53*** (69)	.26 (37)
D	.70*** (113)	.62*** (83)	.62*** (93)	.75*** (91)	.62*** (71)	.41** (42)
Hy	.59*** (108)	.71*** (83)	.48*** (91)	.65*** (90)	.44*** (68)	.15 (40)
Pd	.81*** (106)	.86*** (83)	.72*** (92)	.76*** (90)	.66*** (68)	.51** (38)
Mf	.22* (97)	.51*** (76)	.61*** (90)	.13 (87)	.08 (62)	.41* (35)
Pa	.88*** (104)	.88*** (81)	.83*** (89)	.86*** (86)	.81*** (66)	.31 (38)
Pt	.68*** (105)	.47*** (83)	.74*** (91)	.69*** (87)	.57*** (67)	−.16 (38)
Sc	.74*** (104)	.58*** (83)	.80*** (90)	.72*** (88)	.60*** (67)	.07 (37)
Ma	.85*** (106)	.79*** (83)	.82*** (91)	.86*** (89)	.73*** (69)	.34* (37)
Si	.41*** (89)	−.04 (80)	.45*** (73)	.61*** (64)	.63*** (54)	−.08 (35)

Note: *k* (number of samples) in parentheses.
  * *p*<.05.
 ** *p*<.01.
*** *p*<.001.

effects for the quadratic and cubic terms and large, significant effects for the linear term. Analyses for the MMPI-2, which first were available in 1989, show that most of the increases in psychopathology have continued into the generation born in the 1970s and 1980s (see Tables 1 and 2). The non-significant correlations for some scales could be due to several confounds. The shorter range of years introduces more error, as many researchers do not report year of data collection and thus, year is often estimated; over a span of 16 years this will have more of an effect than over a span of 69 years. In addition, it may be more informative to examine the *rate* of change per year for both scales, as 69 years is a much longer span of time than 16 and thus, would produce more change in a linear effect. When the effect sizes shown in Table 2 are divided by the number of years (69 for the MMPI and 16 for the MMPI-2), the rate of change on the MMPI-2 is equal to or larger than the rate for the MMPI (e.g., *d* = .0126 per year on MMPI Pd, and *d* = .0231 per year on MMPI-2 Pd; *d* = .0117 per year on MMPI D and *d* = .0269 per year on MMPI-2 D; *d* = .0177 per year on the MMPI Ma scale, and *d* = .0175 per year on the MMPI-2 Ma). Thus, the linear increase in psychopathology appears to have continued on the MMPI-2 and in the years since 1989.

3.1.2. Control variables and standard deviation change

Results are similar when examined for men only, women only, or for the MMPI only (see Tables 1 and 2). Thus, changes are not due to the increasing numbers of women in college samples, occur for both sexes, and are not due to the changes in the measure from the MMPI

Table 2
Effect sizes (*d*) using unstandardized *B*s and individual level standard deviations, MMPI scales among college students, 1938–2007.

	MMPI and MMPI-2, all	All, controls for L and K	Males only	Females only	MMPI only	MMPI-2 only (1989–2005)
L	−.30	–	−.08	.54	.09	.33
F	1.48	1.08	1.68	1.55	1.78	.25
K	−.81	–	−.58	1.06	−.90	.21
Hs	.83	.90	.76	1.10	.60	.27
D	.81	.73	.75	1.02	.81	.43
Hy	.45	.49	.45	.54	.40	.10
Pd	1.05	1.02	1.09	1.23	.87	.37
Mf	.30	.83	1.04	.18	.15	.36
Pa	1.21	1.19	1.32	1.12	1.10	.22
Pt	.98	.66	1.19	1.26	.93	−.17
Sc	1.28	1.00	1.65	1.41	1.07	.09
Ma	1.37	1.41	1.43	1.37	1.22	.28
Si	.54	−.05	.57	.79	1.07	−.09

Note: Effect sizes are computed from 1938 to 2007. Means on the L and F scales are not available until 1948, but to keep the effect sizes comparable all are reported for the 69-year period of 1938 to 2007. For the MMPI-2, effect sizes cover 1989 to 2005 only.

to the MMPI-2. Analyses controlling for region (with Midwest as the baseline and dummy variables for East, South, and West) produced very similar results.

The SD of the clinical scales has increased along with the mean (see Table 3). (Note that these analyses should be interpreted with caution, as not all studies reported their samples' SDs and those that did may not be representative). With mean scores and SDs both increasing, more college students are scoring at the higher end of the clinical scales.

3.1.3. Changes in high scores

The upward shifts in average scores indicate that considerably more students now score above a *T*-score of 70, often considered the cutoff for psychopathology because it corresponds to scoring 2 SDs above the mean on the standardized scale with the original means. In 1938, between 1% and 5% of college students scored above 70 on the clinical scales. By 2007, this had increased dramatically. On the Ma scale, 40% of 2007 college students scored above 70 (assuming an SD of 10), as did 33% on Sc, 28% on Pd, 19% on Pt, 19% on F, 18% on Pa, 10% on Hy, 8% on D, and 6% on Hs. Using the 2007 SDs to allow for the rise in SDs (obtained from the regression line of the SDs), 31% of college students by 2007 scored 2 SDs above 50 on Ma, 23% on Sc, 24% on Pd, 17% on Pt, 16% on F, 18% on Pa, 13% on Hy, 6% on D, and 7% on Hs. Six to 8 times as many scored above 70 on Ma, 5 to 7 times on Sc, 5 to 6 times on Pd, and 6 to 8 times on D.

3.1.4. Tests of models

To test the extrinsic vs. intrinsic goals model, we examined the correlation between the clinical scales and the percentage of college students agreeing it was very important to be well-off financially during the same year. These correlations were significant and positive for all of the scales except D (e.g., for Hs, β = .55, *p*<.001, *k* = 67; Ma,
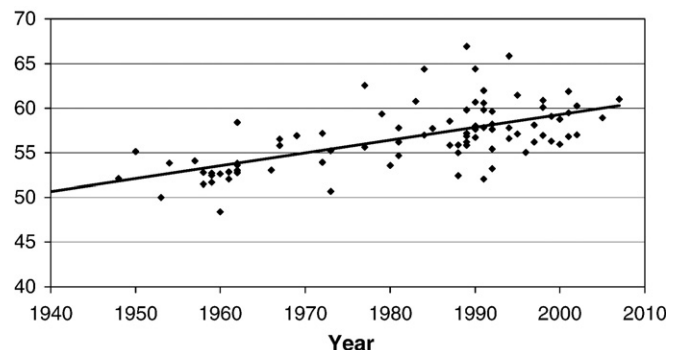
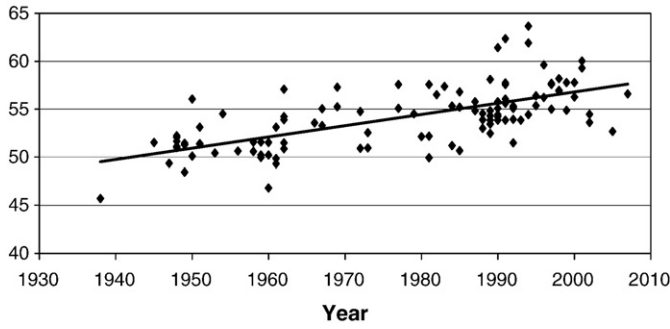**Fig. 1.** MMPI F scale scores of college students, 1948–2007.

Fig. 2. MMPI Depression (D) scale scores of college students, 1938–2007.

Table 3
Changes in MMPI scale standard deviations among college students over time.

	Standardized betas
L	−.03 (21)
F	.56** (22)
K	.12 (26)
Hs	.47** (38)
D	.66*** (41)
Hy	.27 (38)
Pd	.47** (39)
MF	.10 (35)
Pa	.49** (38)
Pt	.38** (38)
Sc	.66*** (38)
Ma	.54*** (40)
Si	.42* (32)

$* = p < .05$, $** = p < .01$, $*** = p < .001$.

$\beta = .51$, $p < .001$, $k = 67$; Pd, $\beta = .38$, $p < .001$, $k = 67$; D, $\beta = .07$, ns). For the intrinsic value developing a meaningful philosophy of life, correlations were mostly significant and negative; as expected, years in which fewer students valued developing a life philosophy included higher average scores on the MMPI clinical scales (e.g., for Hs, $\beta = -.51$, $p < .001$, $k = 67$; Ma, $\beta = -.50$, $p < .001$, $k = 67$; Pd, $\beta = -.36$, $p < .01$, $k = 67$; D, $\beta = .01$, ns) The divorce rate, an inverse measure of intrinsic goals, was positively and significantly correlated with scores on all of the clinical scales (e.g., Hs, $\beta = .56$, $p < .001$, $k = 104$; Ma, $\beta = .79$, $p < .001$, $k = 104$; Pd, $\beta = .57$, $p < .001$, $k = 104$; D, $\beta = .63$, $p < .001$, $k = 111$). This provides additional support for the extrinsic vs. intrinsic goals model, showing that psychopathology is high when extrinsic goals are high and intrinsic goals are low. Although this connection may also be true among individuals, in this context it is best understood at the group level, suggesting that mean psychopathology is higher when more people value extrinsic vs. intrinsic goals.

To test the economic cycles model, we examined the correlation between the clinical scales and the unemployment rate for each year. None of these correlations was significant, and some were negative and some positive (e.g., for Hs, $\beta = .07$, ns, $k = 104$; for D, $\beta = -.09$, ns, $k = 111$). Similar to the linear (vs. curvilinear) pattern of the correlations with year, these results support the extrinsic vs. intrinsic goals model and do not support the economic cycles model.

To test the response bias model, we then examined changes in the L and K validity scales. In contrast to the increases on the clinical scales, K scores decrease over the generations (see Tables 1 and 2 and Fig. 5), while L scores are relatively flat (with a non-significant trend toward a decrease). Thus, more recent generations are less defensive in their responses and somewhat less concerned with making a good impression. These changes in response bias, however, do not appear to be the cause of the shift toward greater psychopathology on the clinical scales, as the increases in the clinical scales are still significant and large when L and K are entered into the regression equation as controls (see Tables 1 and 2). In a few cases, such as F and Pt, the change over time is reduced by about a third; nevertheless, the changes are still strong and significant. Thus, the response bias model receives weak support; K scale scores are down significantly, and some scales show decreases in effect sizes when controlled for L and K. However, the model is mostly disconfirmed as the clinical scales still show strong changes even with the controls.

As Fig. 5 illustrates, K scale scores appear to decline 1930s–1970s and then rise after 1980, very similar to the pattern in Marlowe–Crowne Social Desirability scores found in Twenge and Im (2007). The quadratic term was significant, $\beta = -.19$, $p = .04$, with the linear term much stronger. The rise in K scale scores after 1980 was not significant. Thus, there is a weak pattern of curvilinearity, but K scores primarily show a linear decrease.

3.2. Changes in Mf and Si

The two non-clinical scales, Mf and Si, also showed trends over time. Mf, scored in the direction of femininity, increased among males but not among females. Thus, college men's interest in stereotypically feminine activities and attitudes increased over the generations. Scores on Si, a measure of introversion, increased, although the correlation was reduced to near non-significance when controls for L and K were added.
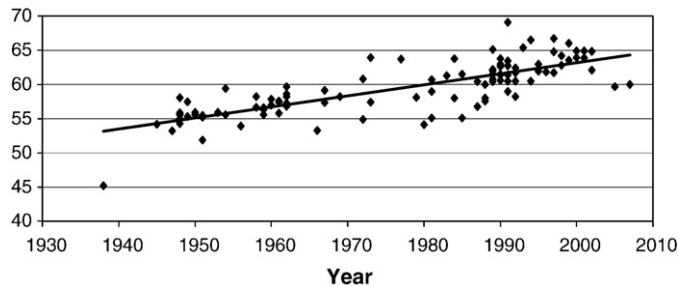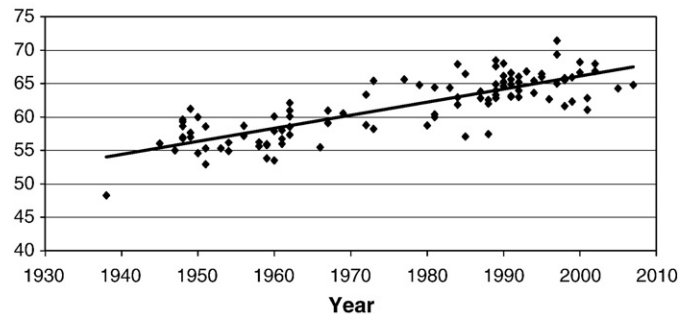

Fig. 3. MMPI Psychopathic Deviation (Pd) scale scores of college students, 1938–2007.

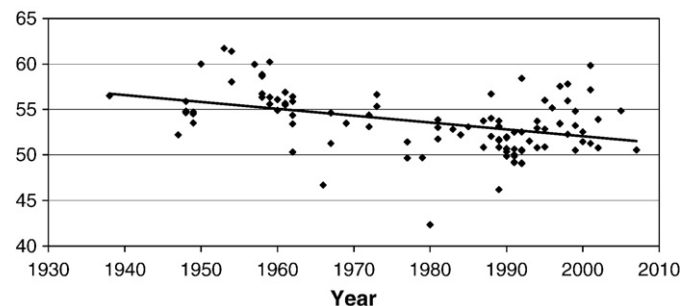Fig. 4. MMPI Hypomania (Ma) scale scores of college students, 1938–2007.

Fig. 5. MMPI K scale (defensiveness) scores of college students, 1938–2007.

Table 4
MMPI-A scores among high school students over time, 1951–2002.

	1951–2002, standardized beta	1951–2002, effect size (d)	1985–2002, standardized beta	1985–2002, effect size (d)
Hs	.76** (11)	1.22	.66* (10)	1.64
D	.72** (12)	1.04	.64* (11)	1.54
Hy	.72** (11)	1.02	.66* (10)	1.59
Pd	.85*** (12)	.86	.61* (11)	.79
Pa	.74** (11)	1.20	.68* (10)	1.77
Pt	.90*** (12)	.81	.46 (11)	.49
Sc	.77** (13)	1.24	.51 (12)	1.19
Ma	.90*** (13)	1.16	.60* (12)	.29
Si	.66* (11)	.39	−.11 (10)	−.12

Notes: Standardized Betas reflect changes at the group level; effect sizes are computed using the individual level standard deviation and reflect changes at the individual level k (number of samples) in parentheses.
* $p<.05$.
** $p<.01$.
*** $p<.001$.

3.3. Adolescents/high school students

We confirmed the increases in college students' MMPI clinical scales in a meta-analysis of adolescents' responses to the MMPI-A. Not enough samples reported scores for L, F, K, and Mf, so this analysis is restricted to the 8 clinical scales and the Si scale. Only 4 samples reported means broken down by gender; thus, we were not able to analyze the data separately for boys and girls.

High school students increased in self-reports of psychopathology between 1951 and 2002 (see Table 4). This suggests that decreases in mental health are not due to changes in college populations, and that the decline in mental health begins at least by mid-adolescence. We also analyzed the data excluding the 1951 sample, leaving only the samples collected since 1985. Adolescent mental health has declined significantly since the 1980s, with increases in psychopathology over 1.50 SDs appearing on the Paranoia, Hysteria, Hypochondriasis, and Depression scales. The larger effect sizes in the 1985–2002 analysis most likely appeared because the data covers a shorter range of years; in the 1951–2002 analysis, there was no data between 1951 and 1985, making the regression line less steep. Overall, the results for high school students confirm the rise in psychopathology also seen in the college student samples.

4. Discussion

American high school and college students report significantly more symptoms of psychopathology on the MMPI over the generations. Each successive generation reports more mental health problems, even when sample gender composition, region, and decreases in defensive responding are controlled. The pattern of change best fits a model of cultural change toward extrinsic rather than intrinsic goals that may have negatively impacted youth mental health. The replication in samples of high school students suggests that changes in college populations are not causing the effects.

Previous findings showing increases in depression over the generations (e.g., Robins et al., 1984; Klerman & Weissman, 1989) were evidently not solely due to biases in retrospective reporting. The magnitude of change here is smaller than the 10-factor increase in rates of major depressive disorder for a 50-year difference in birth years found in previous studies (e.g., Robins et al., 1984). Here, 5 to 8 times more college students in 2007 (vs. 1938) scored above 70 on at least one clinical scale. The bias of retrospective accounts may explain why the effect here is less dramatic (though still very large). Given that increasing numbers of Americans are taking antidepressants (Olfson & Marcus, 2009), this data may actually underestimate the increase in psychopathology, as the samples from more recent years probably included more individuals already stabilized by SSRIs

and other psychotropic medications. More stringent admissions standards at many universities in recent decades may also have suppressed changes in psychopathology (Borges et al., 2006).

These changes most likely reflect underlying cultural shifts and do *not* suggest that the MMPI is no longer a valid measure. The average score of college and high school students is now well above the published norms, but that likely represents a shift in the prevalence of psychopathologic symptoms rather than scale invalidity. One could argue that the MMPI scales are demonstrably valid because they *do* reflect the pronounced changes in American culture between 1938 and 2007.

The extensive research on the MMPI makes it possible to develop a psychological profile of more recent generations of youth (Butcher, 2006; Graham, 2006). Recent generations include more people scoring high on the F scale, which in the 65 to 79 score range predicts moodiness, restlessness, dissatisfaction, and instability. Those scoring moderately high on the Ma (Hypomania) scale are characterized by an unrealistically positive self-appraisal, overactivity, and low self-control. Moderately high scorers on Sc (Schizophrenia) feel isolated and misunderstood. Those with a mild elevation on Pa (Paranoia) are described as sensitive and sentimental. High scorers on Pd (Psychopathic Deviation) are narcissistic, self-centered, and antisocial, and often do not follow the rules and standards of society. They often fight with family members or authority figures. General symptoms of anxiety are also on the rise; high scorers on D, Hs, Hy, and Pt report worry, sadness, and dissatisfaction, sometimes expressed through physical symptoms. Because the meta-analysis is based on changes in mean scores, it is difficult to say whether most college students score higher on all of the clinical scales, or if more individuals score high on only one or two scales. Either way, more recent generations have more individuals who manifest high levels of clinically relevant symptoms.

In their review and analysis on studies of the increasing rate of depression, Klerman and Weissman (1989) noted that large changes over relatively short periods of time cannot be attributed to genetics. Thus, something is changing in American culture that is related to increased psychopathology among youth. It is difficult to prove causation in a correlational study; it is only possible to note what changes have co-occurred with the increase in psychological problems. These data suggest that the rise in psychopathology has coincided with greater importance placed on extrinsic goals such as material wealth and less importance on intrinsic goals such as affiliation (Kasser & Ryan, 1996). In contrast, increases in psychopathology appear to be relatively independent of economic cycles. As American culture shifted toward emphasizing individual achievement, money, and status rather than social relationships and community, psychopathology increased among young people. Eckersley and Dear (2002, p. 1901) argued that societies emphasizing extrinsic goals "may be promoting a cultural norm of personal autonomy and attainment that is unrealistic, unattainable or otherwise inappropriate, resulting in a gap between expectations and realities." Given that 50% of high school students in 2000 expected to obtain a graduate degree but only 10% will likely reach this goal (Reynolds et al., 2006), this seems to be a plausible explanation for at least some of the rise in psychopathologic symptoms.

4.1. Implications

These results suggest that demand for mental health services is likely to increase in the coming decades. College counseling offices already experienced a growing influx of students seeking help between 1989 and 2001 (Benton et al., 2003). Given the recent increase in adolescents' scores on the MMPI-A, the increase in the caseload at college counseling centers likely continued past 2001. Whether this trend has topped out or will continue upward remains to be seen. Ten percent of Americans are already taking antidepressants,

double the number in 1996 (Olfson & Marcus, 2009), and this may increase further.

Researchers who use the MMPI and other measures of clinical symptoms (e.g., anxiety, depressive symptoms) are likely to find that the mean scores of samples of normal young people are elevated compared to original means. Although college students have always averaged over 55 on Pd and Ma, for example, the average scores now regularly rise above a *T*-score of 65. Mean scores on F and D are often 60. The SDs of samples also appear to be on the rise. Future research should address whether these increases also appear on measures such as the Beck Depression Inventory.

Psychologists often design interventions and therapy techniques to improve the mental health and well-being of populations and relieve the burden of mental illness. Most of these interventions focus on individuals, a family, a school, or a neighborhood. Society-wide interventions are of course a more difficult proposition. However, knowing which larger social trends are correlated with mental health, and which lead to more psychopathology, is an important starting point in building a society of people with better mental health. Such interventions can also be applied at the individual level. These results suggest that as American culture has increasingly valued extrinsic and self-centered goals such as money and status, while increasingly devaluing community, affiliation, and finding meaning in life, the mental health of American youth has suffered. It is of course possible, and likely, that there are other factors behind the dramatic increases in psychopathology. However, these results are consistent with the theorizing of several authors arguing that materialism, individualism, and impossibly high expectations have led to an epidemic of poor mental health in the U.S. and other Western nations (Eckersley & Dear, 2002; Kasser, 2003; Myers, 2000; Seligman, 1990). Thus, interventions (at the individual, group, or societal level) should focus on building the importance of intrinsic goals and de-emphasizing extrinsic goals. Such interventions must work against current American cultural values such as materialism, but the benefit may be improved youth mental health.

4.2. Limitations and interpretations

This study examined high school and college students; thus, it cannot be generalized to the American population as a whole. High school and college samples showed similar results, suggesting that changes in college populations are not the reason for the increases in psychopathology. In addition, if changes in college enrollment are behind shifts in MMPI scores, the pattern of change would not be linear but would instead follow the curvilinear pattern of college enrollment, with decreases in the 1970s/early 1980s and late 1990s; it is also unclear which direction these changes would influence MMPI scores, especially given recently tightened admissions standards at four-year colleges and universities. However, population changes cannot be completely ruled out as an alternative explanation for the changes in the college samples. Apparently more individuals high in psychiatric symptoms entered college samples over the last seven decades; this could have occurred because more young people as a whole experience these symptoms, or because individuals with poor mental health were more likely to enter four-year universities recently than they were in earlier eras. Results for the high school population suggest that more young people overall experience poor mental health. At the very least, college campuses now have a larger percentage of students with more serious mental health problems.

Most of the previous studies that did not find cohort increases in depression examined child samples (Costello et al., 2006; McArdle et al., 2003; Twenge & Nolen-Hoeksema, 2002). It is thus possible that generational increases in psychopathology may not appear until adolescence when the emphasis on extrinsic vs. intrinsic goals becomes stronger. Twenge (2000) found increases in anxiety among children, but those data ended in the early 1980s. Further research

should explore whether the social forces behind the increases in psychopathology have also affected children in recent decades.

Another question lies in interpretation. If the average score is now fairly high on scales measuring psychopathology, perhaps poor mental health is the new norm and should be considered "normal." However, endorsing more items on the MMPI clinical scales presumably still means greater psychopathology. It may be more common now to experience anxiety and depression, but that does not make these symptoms any less problematic. It is also possible that recent respondents are more willing to admit to problems. However, the significant results after controlling for two scales of socially desirable and defensive responding suggest that this does not account for most of the increase in psychopathologic symptoms. It is possible, however, that psychopathologic symptoms have become socially acceptable. If this is the case, the L and K scale controls, which measure the desire to appear socially acceptable, might not fully account for the changes in being willing to admit to problems. Of course, this would also be a cultural change, but a change in the acceptability of psychopathology rather than in psychopathology itself.

These analyses examined U.S. samples only; thus, it is unknown whether the same trends have occurred among the youth of other nations. Future research should examine changes in anxiety, depression, and psychopathology among people in other cultures. Similar cultural shifts toward extrinsic vs. intrinsic goals have occurred in other Western democracies (Nafstad, Blakar, Carlquist, Phelps, & Rand-Hendriksen, 2007) and are spreading to more traditional cultures such as China; thus, it is likely that the same trends would appear among youth from these nations. In fact, mental health does appear to be declining among Chinese adolescents (Xin & Zhang, 2009).

5. Conclusions

Like most individual characteristics, psychopathologic symptoms are determined by many factors. The individual family environment is a relatively weak predictor of neuroticism and other personality traits, with genetics explaining much more of the variance (Bergeman, Plomin, McClearn, Pedersen, & Friberg, 1988; Langinvaionio, Kaprio, Koskenvuo, & Lonngvist, 1984; Loehlin, 1992; Rowe, 1990). There are also strong genetic predispositions to unipolar depression, bipolar disorder, and schizophrenia (Klerman & Weissman, 1989). The large changes in MMPI scores demonstrate that there are also strong cultural influences on psychiatric symptoms — that is, an environmental influence outside of the individual family. Over time, American culture has increasingly shifted toward an environment in which more and more young people experience poor mental health and psychopathology, possibly due to an increased focus on money, appearance, and status rather than on community and close relationships.

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